ELECTRICAL REVIEW

THE PIONEER ELECTRICAL WEEKLY OF AMERICA

VOL. XLIX. No. 1. NEW YORK, SATURDAY, JULY 7, 1906. ISSUED WEEKLY

CHARLES W. PRICE . . . . . PRESIDENT AND EDITOR
STEPHEN H. GODDARD . . . . . SECRETARY AND MANAGER
WM. HAND BROWNE, JR. . . . . TECHNICAL EDITOR
AINSLIE A. GRAY . . . . . MANAGING EDITOR

PUBLISHING OFFICE . . . . . 13-21 Park Row, New York
WESTERN OFFICE: Fisher Building, Chicago, Ill. L. W. MARSHALL, Manager
BOSTON OFFICE: Delta Bldg., 10 Post Office Square, M. W. BARBER, Manager
EUROPEAN OFFICE: 42 Old Broad St., London, E. C., HENRY W. HALL, Manager

TELEPHONE "21 Cortlandt." Private exchange to all Departments.
REGISTERED CABLE ADDRESS: "Electview," New York.
Copyright, 1906, by Electrical Review Publishing Co.

TO ADVERTISERS

CHANGES for advertisements should be in this office by *Friday noon* for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than *Monday noon* to assure publication in that week's issue.

SUBSCRIPTIONS

One Year, United States and Canada $3.00
One Year, Foreign Countries 5.00
Single copy, 10 cents. Back numbers, beyond one month, each . . .25

CONTENTS.

EDITORIAL:
The Power Plants at Niagara Falls . . . 1
Progress in Electrification . . . 2
The Portable Substation . . . 2
The Prize Paper on Methods of Getting New Business . . . 3
Electric Smelting of Iron and Steel . . . 3
Test of a 5,000-Kilowatt Curtis Steam Turbine . . . 4
Electricity on Steam Railroads . . . 5
Calvin W. Rice Accepts the Position of Secretary of the American Society of Mechanical Engineers . . . 6
Electric Railways in Australia . . . 6
The Electrical and Mechanical Equipment of the New Clubhouse of the Engineers' Club, New York City . . . 7
Belgian Telegraph and Telephone Service . . . 9
BOOK REVIEWS . . . 9
The Hydroelectric Plant of the Baker Light and Power Company, Baker City, Ore . . . 10
Motor Loads in Small Towns, by Howard S. Knowlton . . . 13
The Electrical Works of the Allis-Chalmers Company . . . 14
The National Electrical Contractors' Association . . . 18
Gas Engine Ignition . . . 18
Opening of the Teltow Canal . . . 18
Flour Bleaching with the Aid of Electricity . . . 18
The National-Interstate Telephone Association . . . 19
Illinois Independent Telephone Association . . . 23
New York Pay-Station Telephone Rates . . . 23
Seventh Annual Meeting of the National Electrical Trades Association . . . 23
Railway Men Visit Schenectady, N. Y . . . 23
New York City Brings Suit to Get $5,000,000 . . . 23
The World's Coal Supply . . . 23
REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE . . . 24
METHODS OF GETTING NEW BUSINESS—"Organization and Conduct of a New Business Department Suitable for Central Stations in Cities of 50,000 Population and Under," by M. S. Seelman, Jr . . . 26
INDUSTRIAL SECTION:
Small Riveted-Frame Induction Motors . . . 29
Central Station Advertising at the National Electric Light Association Convention . . . 30
The Exhibit Plant of the Automatic Refrigerating Company . . . 30
Railway Equipment for the United Railroads of San Francisco . . . 31
CURRENT ELECTRICAL NEWS . . . 32

THE POWER PLANTS AT NIAGARA FALLS.

The recent convention of the Canadian Electrical Association at Niagara Falls, Ontario, created an opportunity for describing the large hydroelectric plants there and called attention again to the remarkable work going on. No other place in the world offers anything like it, for there are there not only the largest hydroelectric plants ever constructed, but there are five such plants, all of magnificent proportions, constructed on at least three plans. In fact, it might almost be said that there were five different types. Three plants, it is true, are of the wheel pit type, but one of these is really two independent plants placed side by side. The second is one large plant placed over a single long wheel pit, while the third differs from the other two in employing a shorter tunnel driven under the bed of the river. The second of the five plants to be erected uses an open canal with vertical steel penstocks, while the remaining plant, which, indeed, is the largest of all, carries its water from the headworks through large steel pipes, from which it is taken through penstocks to the turbines.

The first three stations use vertical turbines, while in the latter two the horizontal type has been adopted. A significant feature of the newer work is the larger size of the units. Those of the original power-house were rated at 5,000 horse-power, while in one of the newer stations the rating is 13,000. Such an enlargement indicates a wonderful development in the construction of both hydraulic and electrical machinery.

Another feature of the newer plants is the separation of the transformer house from the power-house. While at the original station this was done, the two houses there were separated by a short distance only, but on the Canadian side, due probably to the topographical features of the land, these houses have been placed much further off, and in one case—that of the Ontario Power Company—the switching apparatus has been taken along with the transformers, thus dividing the power plant into two sections—generating and controlling houses. The operation of this plan in practice will be watched with considerable interest, for although a more or less complete separation of the switchboard room from the generating room has been adopted in a few instances, this has been only at smaller plants, and the switchboard room has always been adjacent to the generating room. In the new plant the only communication will be by means of signals and the telephone.

A very essential feature of the new work is the guarding against all possible accidents. Reserve apparatus is provided, conduits are in duplicate, and, in one case, four are provided, one being held entirely in reserve. The stations are as fireproof as iron and concrete can make them, and no possible contingency seems to have been overlooked. It is also noteworthy that all of these stations are providing for high-voltage transmission up to 40,000, 50,000 or even 60,000 volts.

Any one of these notable stations would be sufficient to attract visits of engineers from all parts of the world, but we have here not merely the largest hydroelectric station in the world, but five such installations, and these offer examples of considerably differing practice, rendering the vicinity far more interesting to engineers. The work going on there can only be described as stupendous, although we have grown more or less familiar with it, since the original plant has been in operation long enough for the novelty to have worn off. The work, nevertheless, is unparalleled anywhere else in the world, and it seems likely to remain so, for the plans proposed for developing Victoria falls, in South Africa, seem to have made little or no headway.

PROGRESS IN ELECTRIFICATION.

That progress is being made in the question of electrifying steam railroads was made evident at the recent meetings of steam railway men at Atlantic City, N. J., where there were about 5,000 in attendance at conventions, representing nearly all of the great railroad systems of the country. Here there was a strong undercurrent of enthusiasm on all questions connected with this great problem. On the other hand, it is probably safe to say that some of the large railway systems have not been averse to delays in the development of apparatus and machinery for this electrification, because of the vast amount of capital which is tied up in their present motive power, and any developments which might abruptly force the casting away of this valuable equipment are to be dreaded.

But on the whole, the attitude taken by the engineers who are dealing with these questions, and the open mind which the operating railway officials maintain, indicate that, mentally at least, if not physically, this movement has made much progress, and probably the next few years will bring about large and momentous changes.

An incident of this coming together of railway men was the report of a committee to the American Railway Master Mechanics. This committee had been instructed to consider and present to the association a report upon the relative advantages of electric traction as applied to interurban and suburban lines. The committee did not think that it had sufficient accurate data to point out the relative operating costs of the electric system as compared with steam, but it called attention to features of the electric system which are drawing traffic away from the steam roads. These are, as has often been pointed out, the more frequent service obtainable and the absence of smoke and cinders. The latter feature will appeal strongly to all who are forced to use steam trains during the hot months. In the cities, abatement of the smoke nuisance has been under consideration for some time past, and some headway has been made. The steam roads, however, are left pretty much to themselves to use any fuel they see fit in outlying districts. Little or no importance seems to be attributed to this irritating condition, and, in general, that kind of coal seems to be employed which is cheapest from the purchasing agent's point of view. It is true that at certain of the larger cities in this country the adoption of electric propulsion is being considered, or is even being carried out, but this is work requiring a good deal of time, and the electrical zones which have been mapped out do not extend very far into the country. One would think that the steam roads would recognize the ill effects of the nuisance and do something, at least, to abate it, thus diminishing in part the contrast between their method of operation and the competing electric lines. Even though the promise to electrify may hold their patrons for a year or so, the experience of a prospective patron on such a road during a hot day is almost sure to drive him elsewhere. Are the steam roads willing to stand still while their rivals forge ahead?

Part of the report referred to above dealt, in a general way, with the so-called independent motor cars—that is to say, cars equipped with gasolene or oil engines which drive directly or through electric gearing. The equipments of a number of cars were described, and some approximate figures for the cost of operation given, but no definite conclusions were reached. The committee, in fact, seemed more impressed with the prospect that the members of the association would soon have to take care of electrical apparatus, and the necessity of becoming familiar with it, than with the possibility of competing electric roads drawing away the traffic of those steam roads which do not give more consideration to the comforts of their passengers.

THE PORTABLE SUBSTATION.

The description of the two portable substations which form a part of the equipment of the Long Island Railroad's electrical zone calls attention to an interesting development in electric railway engineering. These substations, which were referred to in the ELECTRICAL REVIEW for June 30, are merely two heavy cars on which are mounted one complete unit of a standard substation, this unit consisting of a 1,000-kilowatt rotary converter with its accompanying group of three stationary transformers, each rated at 375 kilowatts, and with the necessary switches and indicating apparatus. These substations are intended to be used at outlying points where there are occasional excessively heavy loads. For example, during the racing season, one of the substations may be run out near the race-tracks and assist in handling the many and heavy trains which must be started from that point within a short time. At other times the substation may be utilized elsewhere, and when there is no special load it can be stationed at a regular substation, where it may act as a reserve or take care of such unusual loads as may come there.

The equipment of each of these portable substations forms in itself what would, in many places, constitute a very respectable stationary equipment. In fact, it is only a few years ago that we looked upon a 1,000-kilowatt rotary converter with a good deal of awe; and, a little further back, generators of the same rating were spoken of as evidences of the remarkable development in electrical design and construction. But here we have two such machines, each placed upon a truck, to be carted out at will. It reminds one of the practice in the old days of the horse-car, when hill horses were placed at steep sections of the road during certain parts of the day, so as to help out the regular team.

This development of the portable substation is an outcome of the adaptation of high-tension polyphase power transmission to electric railway operation. As soon as the electric railway had been shown to be practicable, the excursion feature was developed, resulting in occasional heavy loads which the ordinary equipment could not handle. The same problem was met in dealing with the crowds which gathered at places of amusement. In those days great difficulty was experienced in getting the cars away on account of the heavy load on the feeder line. Sometimes what was, in effect, a breakdown took place, as it was possible to start the cars only every few minutes. The first step to meet this condition was to run extra feeders to these

points, but the expense and poor economy of doing this was evident. Then arose the practice of installing boosters—that is to say, machines intended merely to compensate for the loss of potential in the feeders. They were connected in series with the load and raised the voltage some 200 volts or so, so as to maintain it normal at the point of load. Such a device was undoubtedly extremely wasteful, since the whole output of the booster was lost in the line; but it had the effect of keeping the road running, and where the meetings were somewhat infrequent, it was, on the whole, less costly than paying interest on a large amount of copper.

The introduction of high-tension transmission for this work offered another solution, which, if we remember correctly, was utilized first at St. Louis, and which was substantially that now adopted by the Long Island Railroad. It was nothing more than the mounting of a rotary-converter equipment on a car, which could be hauled around the city to whatever point was needed. Its use by the Long Island Railroad on a larger scale is a noteworthy feature of this road's magnificent equipment.

THE PRIZE PAPER ON METHODS OF GETTING NEW BUSINESS.

Last March the Cooperative Electrical Development Association, of Cleveland, Ohio, announced a competition, open to all central station managers and their employés in the commercial department, for the three best papers on the organization and conduct of a new business department suitable for central stations in cities of 50,000 population and under. The decision as to the winners was left to a committee of three central station managers to be appointed by the president of the National Electric Light Association. At the recent convention of the National Electric Light Association at Atlantic City, N. J., the winners of these prizes were announced. The first prize was $500; the second prize, $300, and the third prize, $200. It is the purpose of the Cooperative Electrical Development Association to give these papers as wide publicity as possible, and as the initial step in this programme of publicity the three papers winning the three prizes and four papers receiving honorable mention will, from time to time, be published in the technical journals, and later distributed in pamphlet form.

We take pleasure in publishing on other pages of this issue the first portion of a very interesting and practical paper by M. S. Seelman, Jr., of the Edison Electric Illuminating Company, Brooklyn, N. Y., winner of the $500 prize. No one who reads Mr. Seelman's paper can help becoming enthusiastic over the suggestions he makes for improving the demand for current. There is not a single suggestion, apparently, that is impracticable; in fact, it would seem that as Mr. Seelman lays it out, the matter is one of great simplicity. Too much can not be said in praise of the organization which initiated this movement, and if the papers receive the attention they deserve, a vast amount of good will be accomplished.

About ten months have passed since active work was begun in a systematic way to stimulate the use of electric current, and reports giving definite figures of the results accomplished would be interesting as well as helpful in directing the progress of the movement.

ELECTRIC SMELTING OF IRON AND STEEL.

In the ELECTRICAL REVIEW for June 23 some comments were made upon the recently issued report of the Canadian commission appointed to investigate the electrosmelting of iron ores. While that report took a most optimistic view of the problem, hope was expressed that further experiments and studies would be made before committing the Canadian government to any heavy expense. The feeling was expressed that the matter was too important to be decided hurriedly, and upon a single series of tests conducted on a comparatively small scale.

Since this hope was expressed, a brief report has come to hand of an opinion given before the Institution of Civil Engineers, of Great Britain, by Mr. R. E. Hadfield, on electric smelting. Mr. Hadfield is a metallurgist of long experience, so that his statements must be accepted with weight, even though he be inclined to look somewhat coldly on the proposal to use the electric furnace for producing iron and steel. He holds that not all the problems involved in the electrical production of steel have been solved, and he believes that the Bessemer and Siemens-Martin processes, with possibly some refinements, will continue in use for a long time. About one-seventh of the world's production of coal is used in smelting iron alone. This is aside from the large quantities utilized in making steel. Furthermore, Mr. Hadfield questioned whether the electric furnace does produce any purer quality of steel than the older processes.

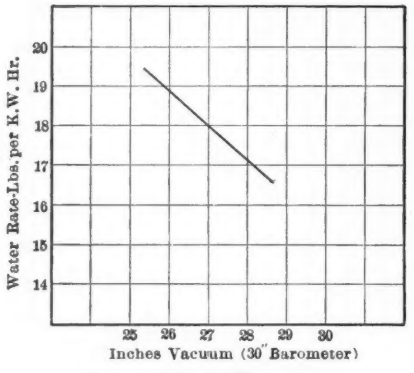
These opinions, coming from one who undoubtedly believes that the old processes have been highly developed, need not be accepted without question. Electrical methods have usually been successful for reasons other than a reduction in the cost of power. Many advantages always follow from the use of this convenient form of energy, and a comparison of the costs of heat supplied electrically and by means of coal will not settle the question any more than will a few experimental trials. The true outcome will probably be neither that predicted by the electric furnace advocates, nor that feared by the users of older processes. The former, as has been true of many engineers and others who have assisted in developing an electrical method, are apt to be a little too enthusiastic; or perhaps it would be better to say a little too confident. To some anything is possible, if only an electrical method is obtainable. Fifteen years ago we were told that the steam locomotive was on its last wheels, and shortly would become a curiosity; yet how many to-day have really been displaced, and, on the other hand, who will now venture to say what will be the railway motive power ten, or even only five years from now? Would it not be better if we paid more attention to past experience and were a little less positive in our predictions?

The electric furnace has to its credit a great deal of invaluable work. We now use in large quantities, which before its application were chemical curiosities. But there have been good reasons for its use here, and they do not necessarily prove that it is the best apparatus for all thermal processes.

Test of a 5,000-Kilowatt Curtis Steam Turbine.

In March, 1906, a series of tests was made on one of the 5,000-kilowatt Curtis steam turbines which has been in commercial service for about one year in the Fisk street station of the Commonwealth Electric Company, Chicago, Ill. The turbine set is one of four installed in this station.

The generating unit consists of a 5,000-kilowatt turbine, direct-connected to a six-pole, three-phase, 5,000-kilowatt, 9,000-volt, 500-revolutions-per-minute revolving



TEST OF STEAM TURBINE.

field generator. All the tests, except those for speed, were made under regular commercial load conditions. On account of the change in frequency during the speed tests, the load was absorbed by a water resistance, composed of plates in the Chicago river. It was found that the water rate for the commercial load was identical with that obtained by use of the water rheostat, other conditions remaining the same.

In the commercial tests the load despatcher maintained a constant load on the turbine under test by varying the tension of the auxiliary governor spring by means of a motor controlled from the switchboard. The steam pressure and superheat were kept as constant as possible by giving proper attention to the boilers.

The load was measured by special indicating wattmeters, connected to independent potential and current transformers. All instruments were carefully calibrated at Schenectady and the calibration later verified in the laboratory of the Commonwealth Electric Company. As an additional precaution to insure accuracy, the readings taken were checked by readings obtained from a duplicate set of instruments calibrated by the Electrical Testing Laboratories, of New York. The load readings were recorded at intervals of two minutes.

All tests were made at about 150 degrees Fahrenheit superheat, the temperature being read by calibrated mercury thermometers. The thermometers were placed in wells filled with mercury and proper correction was made for the exposed stem. Temperatures and pressures were recorded every five minutes.

The amount of steam used was obtained by discharging the condensed steam into tanks, where it was weighed. After each run the condenser was tested for leaks, which, as shown by the tables, were of small amount.

The detailed results of the test at 500 revolutions per minute are shown in table i. Table ii gives the readings obtained at 650 revolutions per minute. To make the tests comparable, all results were reduced to 150 degrees superheat, one and one-half inches back pressure and 175 pounds (gauge) steam pressure. The reduced water rates are given in the ninth column of tables i and ii. Tables i and ii are summarized in tables iii and iv, respectively, and from these are obtained the curves shown in Fig. 1. Fig. 2 shows the performance of the turbine at 500 and 650 revolutions per minute.

TABLE III (SUMMARY TABLE I).

500 revolutions per minute. 150 degrees Fahrenheit superheat. 1½ inches back pressure. 175 pounds steam pressure (gauge).

Kilowatt.	Load.	Water Rate.
2,500	½	17.74
3,750	¾	17.08
5,000	Full	16.62
6,250	1¼	16.52
7,500	1½	16.90

TABLE IV (SUMMARY TABLE II).

650 revolutions per minute. 150 degrees Fahrenheit superheat. 1½ inches back pressure. 175 pounds steam pressure (gauge).

Kilowatt.	Load.	Water Rate.
3,750	¾	16.35
5,000	Full	16.07
6,250	1¼	15.88
7,500	1½	15.80

The tests were conducted under the supervision of the representatives of the purchaser, Sargent and Lundy, and those of the General Electric Company, Schenectady, N. Y.

TABLE I.

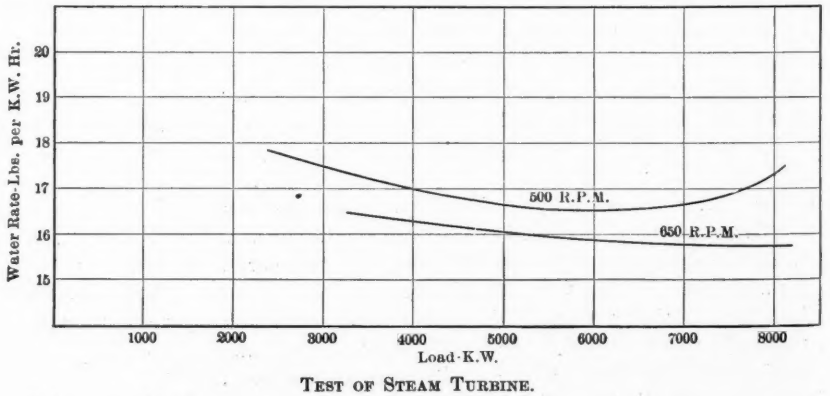
Load. Kilowatt	Steam Pressure (Gauge).	Superheat. Degrees Fahrenheit.	Gross Flow. Pounds Hour.	Condenser Leakage. Pounds Hour.	Back Pressure. Inches Mercury.	Revolutions per Minute.	Water Rate. Pounds per Kilowatt-Hour. Actual.	Water Rate. Pounds per Kilowatt-Hour. Reduced.*	Notes.
3,340	171	151	56,690	1,070	0.89	500	16.66	17.29	Water rheostat.
5,940	169	180	98,370	950	1.72	"	16.40	15.55	Commercial.
2,920	172	158	50,930	1,050	1.08	"	17.08	17.61	"
4,860	179	180	81,550	1,700	1.55	"	16.50	16.81	Water rheostat.
7,525	175	147	130,200	820	2.09	"	17.19	16.91	" "
4,950	180	171	80,370	220	1.48	"	16.23	16.55	Commercial.
0	178	150	3,520	220	1.40	"	....	....	Full voltage.

* Reduced to 150 degrees Fahrenheit superheat; 1½ inches back pressure; 175 pounds gauge steam pressure.

TABLE II.

Load. Kilowatt.	Steam Pressure (Gauge).	Superheat. Degrees Fahrenheit.	Gross Flow. Pounds Hour.	Condenser Leakage. Pounds Hour.	Back Pressure. Inches Mercury.	Revolutions per Minute.	Water Rate. Pounds per Kilowatt-Hour. Actual.	Water Rate. Pounds per Kilowatt-Hour. Reduced.*	Notes.
3,530†	170	165	55,900	1,070	0.85	650	15.55	16.40	Water rheostat.
5,140	180	179	81,930	1,700	1.50	640	15.67	16.03	" "
8,090	177	141	131,160	820	2.03	640	16.11	15.80	" "

* Reduced to 150 degrees Fahrenheit superheat; 1½ inches back pressure; 175 pounds (gauge) steam pressure; 650 revolutions per minute.
† Average of two points.



TEST OF STEAM TURBINE.

Electricity on Steam Railroads.[1]

The instructions of your committee on electricity on steam railroads read as follows: The committee shall consider and present to the association the relative advantages of electric traction now in use as applied to interurban and suburban lines; also, as far as possible the relative cost of operating such lines by electricity and steam. The committee is also instructed to include in its investigations the different systems of gasolene, gasolene-electric and steam motor cars.

This commission is almost the first recognition in this association of other motive power than the steam locomotive and your committee doubts its ability to cover the whole ground of its instruction in a perfectly satisfactory and comprehensive manner, for the reason that the factors in each railroad proposition vary from its neighbor even as men vary in their personal characteristics.

We understand that main line operation is not to be considered, but that branch lines, suburban and interurban lines which are feeders to main lines are to be discussed. We understand, also, that the question relates mainly to passenger traffic on account of the expression "now in use," as electric traction of freight is carried on to a limited extent only at the present time. Mail, baggage and express are being handled, but these are generally considered in connection with or a part of the passenger traffic.

In early electric street railway traction several attempts were made to utilize an electric locomotive, but these were generally abandoned, although it is customary now on some roads to have trail cars attached to leading motor cars. The latest and most advanced practice is to have all cars equipped with motors controlled from the leading car. The development in electric cars has been marked not only by their increase in size and carrying capacity, but also in the size of motors employed. The earlier cars had fifteen or twenty horsepower equipment, but it was soon found that these were inadequate to properly accelerate loaded cars, and now many heavy suburban cars are equipped with four seventy-five-horse-power motors, each, and in some cars the motor equipment totals 400 horse-power.

We have, therefore, available for comparison the steam railroad train, consisting of a locomotive with as many cars as the service demands, running at infrequent intervals, and covering perhaps 200 miles per day, as against the same road operated with individual electric cars, obtaining power from a general source, running at frequent intervals and fairly equivalent mileage.

The travel which is contemplated is the local, short runs, which in many cases have been taken from steam railroads by competing electric lines, this proving that the more frequent service and general convenience of the trolley line is more attractive. Absence of smoke and cinders, open cars in season, connections with city lines, all add to the popularity of the trolley and give a business that can be profitably carried at lower rates, which, after all, is the main inducement.

RELATIVE COSTS OF OPERATING BY ELECTRICITY AND STEAM.

The relative costs of operation with electricity and steam are difficult to state as there is very little accurate information of value. The results obtained by attempting to draw comparisons from hypothetical roads would depend entirely upon the assumptions which were made. For instance, a set of conditions could be assumed which would show a much lower cost of operation by electricity than by steam; another set could be assumed which would show practically equal cost, and a third set which would show that steam operation would be the most economical. In view of the fact that the assumptions would govern the results, it is believed that information of this nature would not be of value to the association and might lead to erroneous assumptions and misunderstanding.

A number of electrifications are under way at the present time employing various systems of distribution, and a considerable amount of data will no doubt be available in the near future.

Relative subjects which would be of interest and value to this association are the character of the shops, shop equipment and apparatus necessary for the maintenance and repair of electric equipment; also the power-houses and their equipment.

GASOLENE, GASOLENE-ELECTRIC AND STEAM MOTOR CARS.

Some time prior to the development of electric interurban railways the steam motor car or dummy, in many cases hauling a trailer, was used to a moderate extent, but at the present time few of these remain. In response to a demand from railroad managers for a motor car to operate on branch lines and special situations there has been recently a development of motor cars employing gasolene in an internal combustion engine, this engine either directly driving the car or driving a dynamo to generate current to be used for driving motors on the trucks. Some builders interpose batteries between generator and motors to store the current when it is not all needed for propulsion, and to assist in starting on grades when the generator capacity may be insufficient. There is very great flexibility and convenience in this combination, but it is attained at very considerable expense and complication, and requires unusually skilled attendance not commonly available in railroad service.

The examples of the gasolene engine, electric generator, battery and motor types are the cars of the St. Joseph Valley Traction Company's line, built by F. M. Hicks, and the Strang car that lately made a successful run from New York to Kansas City. The gasolene engine on these types is set to run at a constant speed, and this characteristic is essential for the best economy of the internal combustion engine. The size of the engine used may be proportioned to the average power required for normal operation, and the speed variation and excess of power above normal requirements may be supplied by the battery equipment, which also comes into play for lighting and short movements and would also be available to bring the car in in case of a breakdown of the engine or generator.

The gasolene-electric type not employing batteries is illustrated by the D. & H. car recently built by the General Electric Company. The generator on this type of car has to be equal to the maximum requirements, and in order to vary the current for the conditions to be met, the field excitation is handled by a separate exciter, chain-driven from the main generator. The controller is semi-automatic and can be set for any predetermined maximum acceleration, and the speed of the car is governed by varying the field strength of the generator. The speed of the engine remains constant after acceleration. This application is very ingenious and effective, and we understand that the car has been put into regular service between Schenectady and Saratoga.

The Union Pacific motor car, representing the direct mechanical drive application of gasolene power, is driven by a six-cylinder reversible gasolene engine, with crank shaft at right angles to the length of car; a sprocket mounted on same, driving a special chain transmits the power direct to the driving axle through a second sprocket attached to the axle. The chain easily shows a transmission of power with an efficiency of ninety-seven per cent, which clearly demonstrates that this meth-

[1]Committee report to the convention of the American Railway Master Mechanics, Atlantic City, June 18-20.

od of transmission is very close to the maximum efficiency possible.

For the initial start of car, or putting it in motion, a reducing gear is used, and, until the car attains a speed of six or seven miles per hour the economy of this transmission is somewhat reduced; but, as the use of the gears is only temporary and lasts only a few seconds, it can almost be left out of consideration.

The first cars—fifty-five feet long, seating capacity seventy-five, and with an engine of 100 horse-power—are particularly adapted for branch line service, where the traffic is insufficient to support a steam service or anything like electric service.

Interest in the steam car is also being revived, as, for example, the Ganz cars imported from Budapest by the Florida East Coast Railways; the Erie and the Canadian Pacific are also experimenting with a steam car equipped with a Scotch marine type of boiler, using a superheater and oil fuel. It is believed that some one may undertake to make a so-called flash boiler that will be applicable to this service.

SERVICE AND UTILITY OF MOTOR CARS.

It is recognized that the so-called motor car, one carrying its own motive power plant, whether gasolene, gasolene-electric or steam, occupies a distinct field of usefulness. Many branch lines, now existing, where travel is light, and on new extensions into unsettled country where the business will not return a profit on steam train service, it would have to be run at a loss until a sufficient business was induced or built up by the travel facilities afforded. These situations are the distinct field of the motor car, which can be operated for less per car-mile than by regular steam train or electric methods until the volume of business will warrant the regular transportation methods.

The use of motor cars on the Union Pacific in picking up passengers on branch lines and in delivering passengers at connecting points for through trains, is exceedingly lucrative. The matter of giving the branch line patrons of any steam road increased service, with more frequent trips per diem, is very much appreciated by the local community, and their good will is beneficial.

On the hypothesis of the same density of traffic, with the same class of service as would be encountered on one of the ordinary branch lines of the territory west of the Missouri river, the cost per mile for local train service, equipment consisting of two cars and a locomotive, would be about twenty-four cents, including repairs, fuel, oil, labor, cleaning, etc.; this for passenger, as well as baggage, mail and express service.

Electric service equipment, consisting of one car and trailer figuring that the density of traffic is sufficiently regular to support same seven days in a week, is estimated at about eighteen cents a mile.

The gasolene service (mechanical-drive only considered), consisting of one car and trailer, with baggage, mail and express service, would cost fifteen cents per mile. The latter, of course, would be independent of whether service was six days or seven days per week, the cost simply depending upon the service rendered.

Railroads, therefore, have a choice of the systems proposed, and a study of the conditions to be met and facilities afforded, both in the way of care and maintenance, as well as the train service proposed, will give the elements by which each situation will have to be studied. The motive power departments will be called upon to participate more and more in advising as to these questions, and in order to be qualified to undertake such work it is very desirable to introduce information and discussion of these subjects in this association.

The report is signed by C. A. Seley, W. R. McKeen, Jr., L. R. Pomeroy, C. F. Street, F. J. Cole.

Calvin W. Rice Accepts the Position of Secretary of the American Society of Mechanical Engineers.

Calvin W. Rice has accepted the position of secretary of the American Society of Mechanical Engineers, which was offered him by a vote of the council some time ago, and entered the service of the society on July 1. Mr. Rice is a graduate in engineering from the Massachusetts Institute of Technology. He has had a very complete experience in machine shop practice, operating all manner of tools. After graduation he entered the employ of the General Electric Company, working up to the position of assistant engineer of the power and mining department, which he retained until 1885, when he was appointed local engineer at Cincinnati, Ohio, for the General Electric Company. In 1895 and 1896 he was electrical superintendent of the Silver Lake mines, Silverton, Col., and later was connected with the Anaconda Copper Mining Company. In 1898 he was electrical engineer of the Kings County Electric Light and Power Company, Brooklyn, N. Y., and soon after became electrical engineer of the Consolidated Telegraph and Electrical Subway Company, owning and operating the high-tension subways of New York. He has been chief of the meter and testing department of the New York Edison Company, and second vice-president and sales manager of the Nernst Lamp Company. Since 1904 he has been a consulting engineer with the General Electric Company.

Mr. Rice is a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the Institution of Electrical Engineers, of Great Britain (having been proposed by Lord Kelvin), a member of the American Association for the Advancement of Science, the Society of Colonial Wars, and several other organizations.

Mr. Rice's wide experience in handling large organizations, and his keen appreciation of the possibilities of cooperation

CALVIN W. RICE.

among the national engineering societies is indeed fortunate, in view of the closer relationship which is existing among these organizations at the present time. Mr. Rice, it would seem, enjoys the unique distinction of being the man for the place both by training and by nature, and there is no doubt that he will prove a worthy successor to that faithful and beloved genius, Professor Hutton, who retires after a long and faithful service which will always stand as a monument to his integrity and character.

Electric Railways in Australia.

A report from United States Consul-General J. P. Bray, Melbourne, Australia, states that there are fifty miles of electric road in operation in Australia. These are short lines in Melbourne, Sydney, Hobart, Ballarat and Bendigo. Further extension of the electric lines is under consideration more or less by the state governments of most of the states, particularly Victoria, New South Wales, South Australia and West Australia. In Victoria many of the suburban municipalities have under consideration the construction of lines, and much interest is being displayed in that direction.

The Electrical and Mechanical Equipment of the New Clubhouse of the Engineers' Club, New York City.

The new home of the Engineers' Club, which is being built on West Fortieth street, New York city, will be equipped with an electrical and mechanical installation possessing a number of features which have not been tried heretofore to any considerable extent in buildings of a similar character.

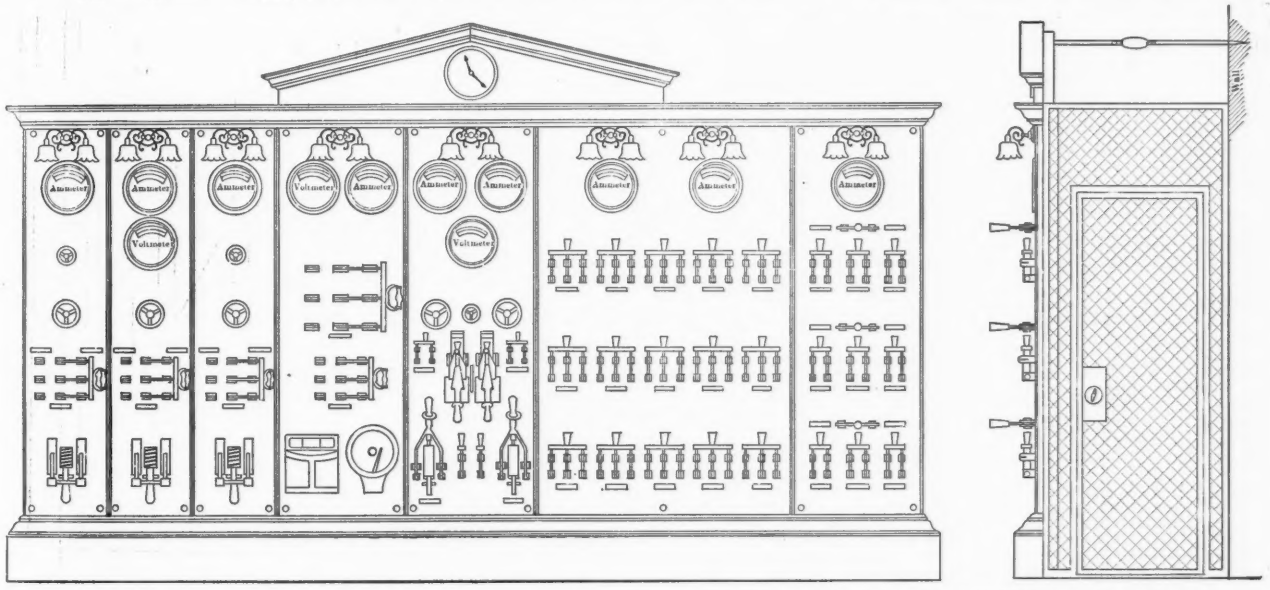
On the first floor of the building there will be located the vestibule, reception rooms, administration office, coatroom, grand stairway, foyer and main hall. This hall will be served by three electric elevators, and at the extreme end of the first floor the main café and grillroom will be situated. The large clubroom will be situated in the front part of the second story, with the library in the rear. The billiard room will occupy the front of the third floor, and the remaining space will be given up to committee rooms and cardrooms. The six stories above will be devoted to bedrooms, and immediately above the bedroom floors there will be the breakfast room, serving room and two private dining rooms with a large reception room adjoining. The entire eleventh story will be taken up with a banquet room, and the twelfth story will be given over to the service work. On this floor there will be located the cooking range, plate warmer, dish washer, steam tables, etc., all of which require service from the heating, ventilating or power system of the building.

The front portion of the roof will be devoted to a roof garden, and at the rear there will be the laundry and a room in which will be located some of the machinery for the ventilating system.

The basement will contain the general toilet, barber shop, steward's office, storerooms, etc. The machinery for the operation of the lighting, heating and refrigerating plant and elevator equipments, and also a portion of the ventilating machinery, will be installed in the sub-basement.

The boiler equipment will include a battery of two water-tube boilers, each having approximately 200 horse-power capacity. Adjoining the boiler room there is provided a coal storage room and a larger storage room in front of the building for handling coal in quantity. The boilers are connected by a steel-plate flue and breechings with the steel smoke-stack which passes up the rear of the building. A hand damper is provided in the smoke connections at each uptake from the boilers. There will also be a balance swinging damper in the main smoke connection, operated by shafting controlled by a Locke automatic damper regulator. A No. 6 "Monitor" pattern Nathan injector will handle the feed water for the boilers.

The primary source of boiler feed supply will be handled by two six-inch by four-inch by six-inch duplex return circulating boiler feed pumps located in the central portion of the sub-basement, just outside of the boiler room. These pumps will also handle the water of condensation from the heating system and will feed fresh water to the boilers. For returning the water of condensation from the tempering coils of the ventilating system to the boilers there will be installed two five and one-quarter-inch by three and one-half-inch by five-inch duplex pumps, and for emptying the blowoff tanks there will be one duplex pump of the same size, making a cross-connection from the draining pit back of the boilers. A four and one-half-inch by two and three-quarter-inch by four-inch duplex pump, connected with the high-pressure drip compartment of a "Utility" tank, and arranged to discharge into the sewer or to the boilers, will take care of the high-pressure drips. All of these pumps are to be controlled by Kiely automatic pump governors. The feed-water equipment will include a heavy pressure feed-water heater and purifier of the closed type, equipped with a thermometer to indicate the temperature of the feed water, and there will also be installed one No. 4 "Utility" combined grease extractor and exhaust muffler tank.



FRONT ELEVATION OF SWITCHBOARD, MECHANICAL AND ELECTRICAL EQUIPMENT, ENGINEERS' CLUB BUILDING, NEW YORK CITY.

A main high-pressure line will take off branch connections extending from the steam drums of each boiler, and from the main line a high-pressure line will run to the engine room, connecting with a high-pressure distributing header for the engines. There will be separate high-pressure branch connections to each engine, with long-sweep bends instead of fittings.

From the high-pressure line a branch main will be taken off near the boilers, connecting with all the steam pumps and moistening apparatus, the kitchen and laundry service, the hot-water tanks, refrigerating apparatus, heating apparatus, air compressors, sewage ejectors, vacuum system exhauster, reducing valves, etc., all individual power branches being run from the top of the main.

The electrical equipment will include

three generating sets, each of the engines being protected by a Cochrane vertical steam separator in the branch pipe. The drip connections from these generating sets will be through automatic discharge taps to the high-pressure receiver of the muffler tank.

A back-pressure valve will be installed on the main exhaust pipe, and the heating and ventilating apparatus and the kitchen apparatus will be protected by pressure-reducing valves.

All the rooms in the building will be warmed by direct radiation. There will be about 228 radiators and heating coils aggregating 9,600 square feet of heating surface.

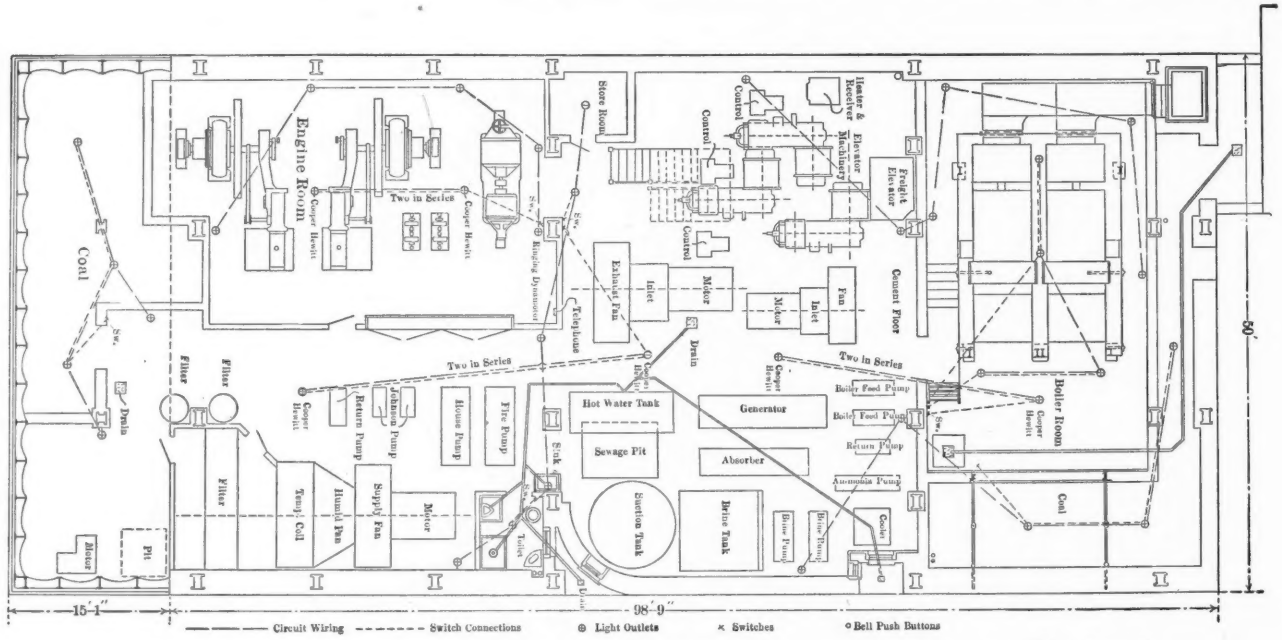
A forced-air system of ventillation will supply fresh air throughout the building in general and in all the important rooms. The building as a whole has been treated as though it consisted of two separate structures. An independent equipment of blower and exhaust fans will be installed in the sub-basement for the lower half, and a similar equipment in the machinery room on the roof for the upper half of the building. The air-supplying fan for the lower stories will be located in the sub-basement, and will have a blast wheel six feet in diameter and three feet, six inches wide. This fan is of the centrifugal type, and has the same dimensions as the centrifugal exhaust fan which will remove the used air. The upper stories will be provided for in a similar manner, the blast wheel of these fans, however, having a diameter of five feet, eight inches, and being three feet wide. For the positive and independent ventilation of certain other rooms, motor-driven blower and exhaust fans will be installed.

For the refrigeration and cold-storage equipment the Carbondale Machine Company will furnish an absorption exhaust steam refrigerating system capable of cooling 1,168 cubic feet of refrigerating box space, and of cooling twenty gallons of brine from ten degrees to zero degrees Fahrenheit per minute.

The equipment of this building affords a very practical demonstration of generosity on the part of the manufacturers, the Allis-Chalmers Company and the General Electric Company giving all three generating sets to the club without charge, the boilers being given outright by the Babcock & Wilcox Company, and the elevators being furnished at cost by the Otis Elevator Company. Two fifty-kilowatt units will be given to the club by the Allis-Chalmers Company, consisting of Corliss-type, simple horizontal engines, direct-connected to Bullock generators running at 125 revolutions per minute. These units will be identical, except that one will be right-hand, and the other left-hand. The General Electric Company has donated a seventy-five-kilowatt unit, consisting of a Curtis steam turbine designed to operate non-condensing and to run at a speed of 2,400 revolutions per minute. The generator will be of the turbo type, and will be direct-connected to the extension of the shaft of the turbine. The complete unit is assembled on one cast-iron sub-base and set horizontally. All three of the generators will be compound-wound for 245 volts at full-load current, and will furnish current for a mixed motor and lighting load throughout the building.

Two rotary balance sets, each consisting of two compound-wound, 120-volt, direct-current generators mounted on a common base, and direct-coupled, will be installed in the engine rooms. The full-load carrying capacity of each of these machines will be forty amperes, and they will be used to furnish current to the neutral of the three-wire lighting system. The main switchboard will consist of seven white marble panels, each seventy-two inches high and one and one-half inches thick. The equipment will include three generators, one total output, one equalizer, one lighting feeder and one power panel. The switchboard will be set in an opening in the engine-room wall, saving considerable valuable space. The front will face the engines, and the board, which will be protected by fireproof doors, will be accessible from the sub-basement. The panels will be mounted on a substantial angle-iron frame, and the front of the board will be finished at the top and bottom with a white marble moulding four inches deep. All of the instruments on the switchboard will be finished in polished copper.

All conduit distribution throughout the building will be concealed in the walls, floors or ceilings, and a panel box will be installed on each floor, from which the conduits for the branch lighting circuits will be run to the various outlets. The power feeders have been treated as a sys-



LAYOUT OF SUB-BASEMENT, MECHANICAL AND ELECTRICAL EQUIPMENT OF ENGINEERS' CLUB BUILDING, NEW YORK CITY.

tem independent of that for the lighting service. The conduit for these feeders will be run direct to the various outlets to be provided near the respective motors for the elevator machines, sidewalk hoist, freight elevator, blower and exhaust fans and other machines. The current for the various motors throughout the building will be distributed at 240 volts by means of the two-wire system.

Separate lighting feeders will be run from the feeder switches on the lighting feeder panel to each floor of the building and to the roof, and connected to distribution panel boards. These feeders will each consist of three wires, and the current will be distributed on the 120-240-volt, three-wire system. From the panel boards two-wire branch circuits will run to the various lighting fixtures throughout the building.

A combination of incandescent lamps and Cooper Hewitt mercury vapor lamps will be utilized for the lighting of the sub-basement.

A call-bell system will be supplied with current from a motor-generator set capable of supplying seven and one-half amperes at eight volts, and an auxiliary primary battery to be used when it becomes desirable to shut down the motor-generator.

For the accommodation of telephone wires a complete conduit system will be installed. The telephone instruments and wires will be furnished and installed by the New York Edison Company. Of the three elevators, two will run from the basement to the roof, and the third from the sub-basement to the roof. The elevator machines will be located in the sub-basement at the foot of the elevator shafts. Each will be of the worm-driven drum type with direct-connected motor of about twenty horse-power, which will drive the cars at a speed of 300 feet per minute. The maximum load which each elevator will carry is 2,000 pounds.

The architects for the building are Messrs. Whitfield & King, and Mr. Putnam A. Bates is the consulting engineer in charge of all the electrical machinery and equipment.

Belgian Telegraph and Telephone Service.

Consul J. C. McNally, of Liege, writes that Belgium has a very good government telegraph and telephone service. The inland telegraph rates are ten cents for fifteen words, twelve cents for sixteen to twenty words, and fourteen cents for twenty-one to twenty-five words. The telephone service costs twenty cents for a five-minute talk, or thirty cents for ten minutes. Each person having a telephone in the house is provided with a numbered ticket, the presentation of which enables the party to use the telephone at pay-stations without further expense. Each member of the family has the same privilege.

BOOK REVIEWS.

"Modern Polyphase Machinery." Andrew Stewart. London. S. Rentell & Company. Cloth. 296 pages. 5 by 7½ inches. Illustrated. Price, 5 shillings.

This book resulted from the revision of a series of articles published in *Electricity*, London, and which were subsequently revised and brought up to date. The matter is clearly presented, no puzzling mathematics being employed. It deals briefly with the underlying principles of the production of electromotive force, describes methods of winding, electrical machinery, goes into some detail over standard practice and construction of alternating-current apparatus, in this dealing also with the newer types of machines brought out for use with steam turbines, and tells something of the performance of these machines and the auxiliary apparatus for controlling them. It forms a very good elementary treatise of the subject.

"Things That Are Usually Wrong." John E. Sweet. New York. Hill Publishing Company. Cloth. 52 pages. 5½ by 8 inches. Illustrated. Supplied by the ELECTRICAL REVIEW at 50 cents.

This is a refreshing little book, in which the author takes issue with a number of mechanical practices usually accepted as good, but which are clearly shown to be absurd or bad. As early as 1872 Mr. Sweet broke away from standard methods in certain lines of work, and he says that ever since those days he has been preaching right and doing both right and wrong—right when he had the courage, and wrong when he was silly or too much of a coward. He does not expect that much good will come of his tirade with the older fellows, for they are not given to changing their practice, even should they be convinced that they are wrong. It is only those who come to think of the best way who are likely to do the best, and those also who think that the best way is bad enough.

"Electrical Engineering in Theory and Practice." G. D. Aspinall Parr. New York. The Macmillan Company. Cloth. 448 pages. 6 by 9 inches. 282 illustrations. Supplied by the ELECTRICAL REVIEW at $3.25.

This work has been prepared to be used as a textbook for students in electrical engineering, and does not differ markedly in character from many other similar works. The title is rather misleading, for the matter dealt with is more of a physical nature than engineering. The fundamental electrical principles are discussed, and methods of measuring electrical quantities. Galvanometers, ammeters and voltmeters and other electrical instruments are described, a few of these being of commercial types. There is a chapter dealing with incandescent lamps, which describes the method of construction; and another on arc lamps, in which some of the newer types of luminous arcs are described. A chapter on the production of electromotive force deals with primary and secondary batteries. There is no discussion of electrical machinery.

"The Principles of Electric Wave Telegraphy." J. A. Fleming. New York. Longmans, Green & Company. Cloth. 672 pages. 6 by 9 inches. Illustrated. Supplied by the ELECTRICAL REVIEW at $6.60 net.

During the past few years Dr. Fleming has been giving not a little of his attention to the subject of wireless telegraphy, cooperating in this work with Mr. Marconi. In his book he has given us what is probably the most complete treatise on the subject in the English language. The subject of electrical oscillations is discussed from the point of theory and experimental results. The different methods of using these phenomena for transmitting signals through space are explained, as well as the method by which this transmission is supposed to proceed. Methods of detecting and measuring electric waves are described in Part II. Part III deals with the practice of wave telegraphy, giving in some detail descriptions of the great mass of work which has been done in this field. Reference here is made most frequently to the work of Marconi, who, in fact, is given credit for being the originator and first practical exhibitor of the new art.

"The Practical Telephone Handbook." Joseph Poole. New York. The Macmillan Company. Cloth. 530 pages. 5 by 7½ inches. 473 illustrations. Supplied by the ELECTRICAL REVIEW at $2.

The author of this book is a member of the technical staff of the National Telephone Company, of Great Britain. In it he confines himself chiefly to British practice, mainly as followed by his company. The book forms a fairly complete exposition of the art of telephony, taking up first the underlying physical principles and dealing briefly with the history of the telephone and then passing to a discussion of the apparatus now in use. All auxiliary appliances are dealt with, and the various systems are described and methods of operating them. The outside plant also comes in for some attention here, English practice in both underground and overhead work being described. Methods of locating trouble and the apparatus employed are dealt with in the latter part of the book. The automatic systems come in for a brief discussion, as well as other miscellaneous appliances. There is an appendix which gives the agreement reached between the British Postoffice and the National Telephone Company.

The Hydroelectric Plant of the Baker Light and Power Company, Baker City, Ore.[1]

THE Baker Light and Power Company is the successor to the original Gas and Electric Company which were at one time separate corporations. The first lighting plant at Baker City, Ore., was built in the early days. It was of the usual type, one high-speed engine driving two forty-kilowatt Edison direct-connected generators feeding into a three-wire network. Later, this plant was abandoned and an alternating-current equipment installed on the outskirts of town, burning sawdust from the mill of the Oregon Lumber Company The little plant finally grew into the South Baker steam plant. The present machinery at this plant consists of two 250-horse-power Cahill water-tube boilers equipped with Dutch ovens for burning sawdust, and one 500-horse-power Nordberg Corliss engine running at seventy-five revolutions per minute, belted to two 250-kilowatt General Electric generators three-phase, 2,300 volts, sixty cycles. This plant delivers current to the substation in Baker City, 1.5 miles distant.

The main power plant is located on Rock creek, a rapid mountain stream heading in the Blue mountains, seventeen miles northwest of Baker City. This stream has a catchment area of eighteen square miles. The greater portion of the basin is between 6,000 and 8,000 feet above sea level. The snowfall runs from six to fourteen feet, rarely disappearing altogether in the summer. The stream above the intake to the flume lies within the Baker forest reserve. The policy of the United States government is to protect especially the young timber and underbrush, a policy which will insure against the injury of the watershed by stripping the country of its timber.

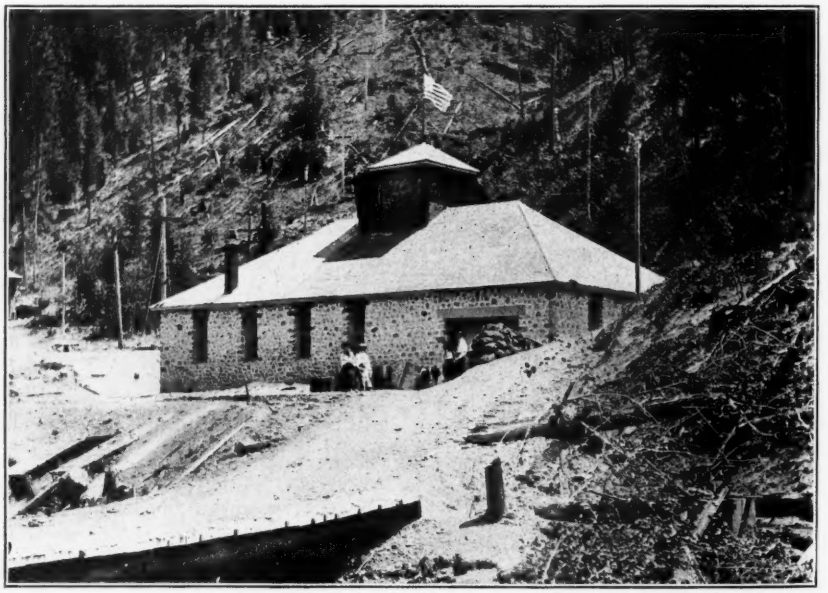
There are two seasons of low water, one in August, before the fall rains, and the other in the early part of January, during the extreme cold weather. The summer low-water is dependent upon the snowfall of the previous winter. The winter low-water depends mainly upon the weather conditions which exist at the time and upon the amount of the fall rains. In the normal season the fall rains fill the ground with water and before steady freezing weather sets in sufficient snow falls to protect it. Melting goes on slowly next to the ground insuring a supply of water not to be expected from a casual inspection.

The intake to the flume is located two miles from the edge of the main valley at an elevation of 5,000 feet.

Water is diverted into the flume by means of a masonry dam thirty feet long and four feet high. The flume is of wood three feet by six feet inside. It is constructed of Oregon red fir two by twelve inches resting directly on mud sills. It is covered the entire length, both for protection from snow and to keep out falling leaves and twigs. During the winter the heavy fall of snow is a protection against freezing. It lies on a dirt bench excavated in the hillside without trestle work. The flume is built on a grade of ten feet to the mile with a capacity of seventy second-feet, with the water two feet deep, and is one and one-quarter miles long.

The intake is provided with a coarse

FLUME, ROCK CREEK POWER-HOUSE OF THE BAKER LIGHT AND POWER COMPANY, BAKER CITY, ORE.



ROCK CREEK POWER-HOUSE, BAKER LIGHT AND POWER COMPANY, BAKER CITY, ORE.

[1] Part of a forthcoming volume on "Hydroelectric Plants of the United States, Canada and Mexico," by A. W. Clapp.

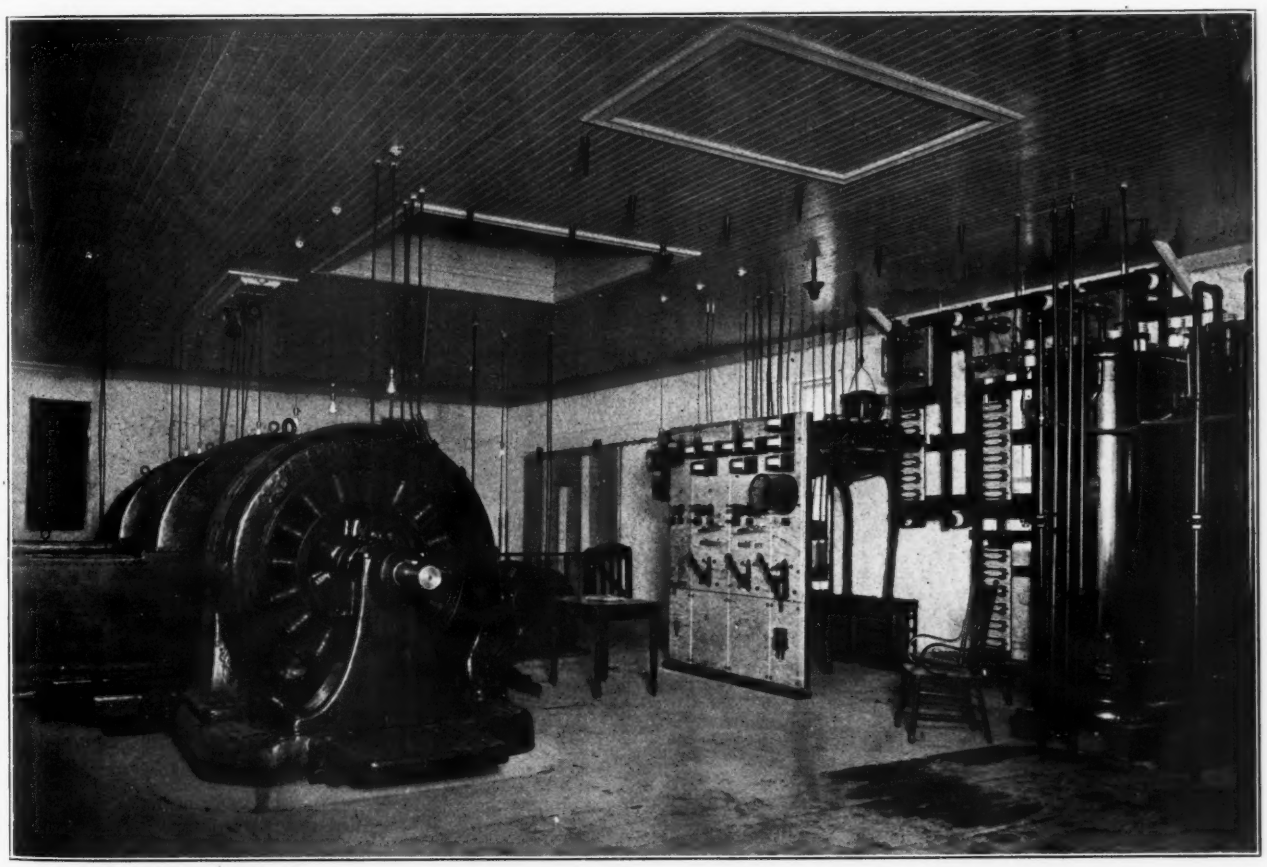
trash-rack while at the lower end, where the water enters the pipe line, a twelve-foot iron rack is built, set at an incline in the flume. This is made of three-eighth

Diverting Dam and Intake to Flume, Rock Creek Power-House, Baker Light and Power Company, Baker City, Ore.

fourteen cubic feet per second, and there is ample capacity in both the flume and iron trash-rack.

The pipe line is connected to the pen-stock by a taper joint thirty-six inches in diameter at one end and twenty-four inches at the other. The pressure pipe is 2,600 feet long. It is twenty-four inches in diameter, No. 12 steel at the upper and fourteen inches in diameter, three-eighth-inch steel at the lower end, with four intermediate sizes and gauges. The lower half is double-riveted longitudinally and single-riveted on the transverse seams. The upper half is double-riveted, the lengths being joined by caulked joints covered by steel leaded collars. The pipe line has a thirty-five-degree curve at the lower end. It is thoroughly anchored in concrete block at all bends. There are six air valves distributed along the line. The pipe line comes through a fourteen-inch gate valve with a twenty-four-inch receiver made of one-half-inch steel. It is provided with three twelve-inch outlets, two fourteen-inch main outlets and one three-inch outlet for the exciter and relief valve. The receiver is anchored to a solid block of concrete.

The power-house is built of rough dressed stone laid up into a twenty-four-inch wall. The inside dimensions are thirty-four feet by sixty-four feet and fifteen feet high in the clear. All foundations are of concrete six feet deep. Two wheels and generators are installed with room for a third. The two units consist each of one fifty-inch special Pelton wheel which will



View in Interior of Rock Creek Power-House, Baker Light and Power Company, Baker City, Ore.

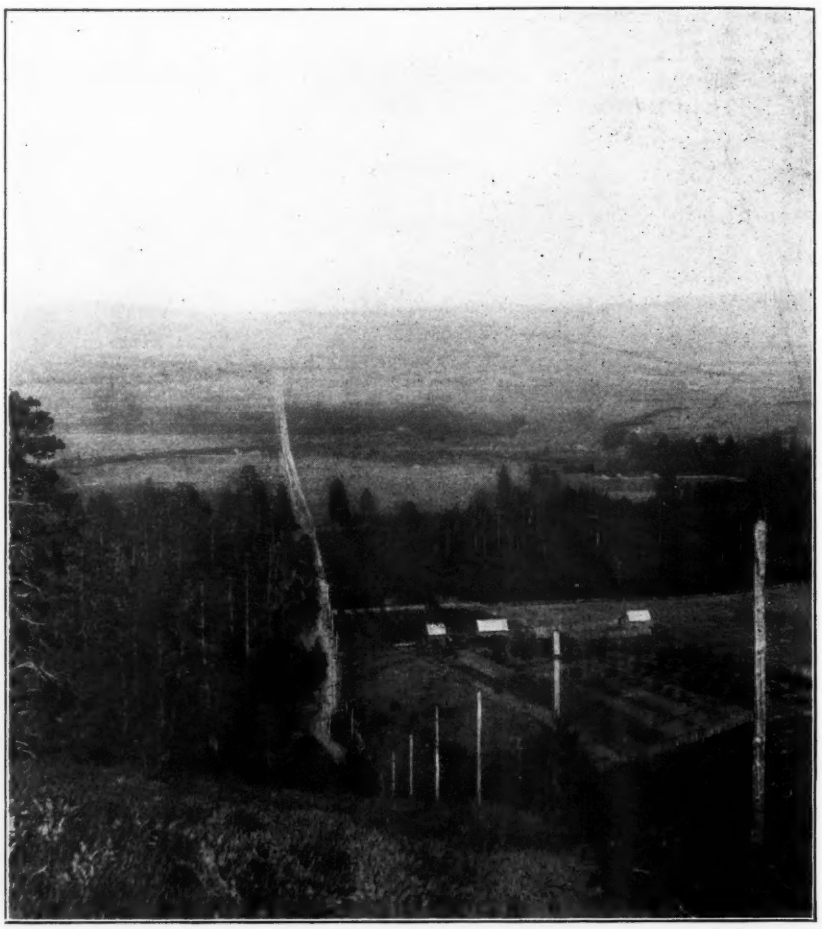
by two-inch flat iron set edgeways to the current, with three-eighth-inch spaces.

At full load in the station the flow is

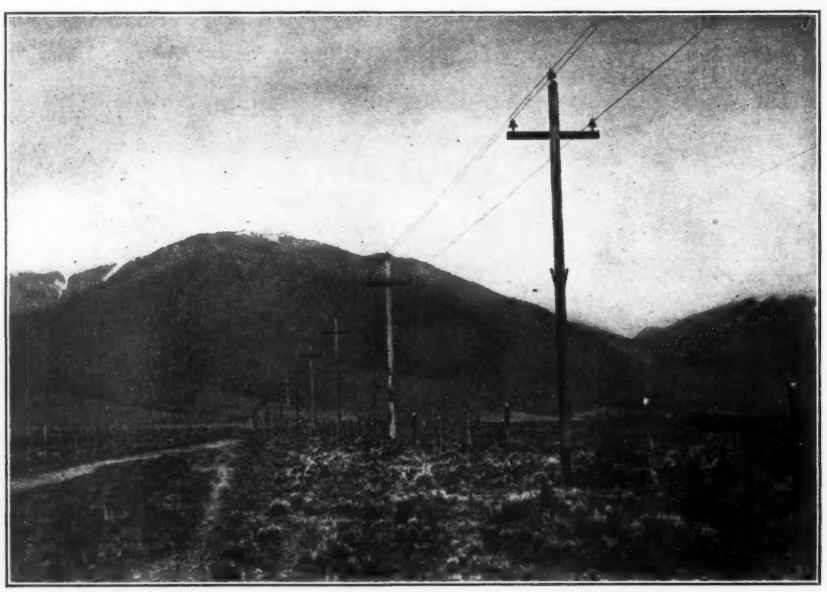
develop 750 horse-power with a 2.45-inch nozzle under a head of 960 feet, driving through leather-link couplings a 400-kilowatt revolving-field, sixty-cycle, 2,300-volt, three-phase General Electric generator at 450 revolutions per minute. One Lombard governor controls both wheels. There is one forty-five-kilowatt exciter driven by a Pelton water wheel overhung from the exciter bearings. The switchboard consists of one exciter panel, two generator panels and one feeder panel with a synchroscope on a swinging bracket. The lightning arresters are of the General Electric multiplex type, three banks of three each to the line, through single-pole high-tension switches. The voltage is controlled by a Tirrill regulator.

There are three step-up transformers oil insulated and water cooled, 300-kilowatt, 2,300 to 22,500 volts, connected in delta. The high-tension wires leave the building through a twelve-inch tile closed with a circle of glass with a hole drilled in the centre for the wire. These tiles are built into a tower on the roof of the station. There is but one set of wires leaving the building. These run to a platform built between four poles carrying the horn type disconnecting switches for disconnecting either of the two transmission lines.

One transmission line runs to Baker City, seventeen miles southeast through the level Baker valley. The poles were cut from the local timber with eight-inch to ten-inch tops. The butts were treated with carbolineum, set five feet in the ground and spaced fifty-two to the mile. The line follows the country roads. All corners are double armed and thoroughly braced. The cross-arms are four by six inches Oregon fir, six feet long, bored for one and one-half holes and bolted to the poles. The top wire is carried on a pin inserted in the top of the pole. The three wires form a triangle five feet on a side. The pins are California eucalyptus, oil treated. The insulators are the Hemingray "Provo," 40,000-volt type. The copper is No. 4 gauge. The telephone wires are carried on brackets ten feet below the power circuits and are transposed every fourth pole.



THE TRANSMISSION LINE AND TRIBUTARY TERRITORY SERVED BY BAKER LIGHT AND POWER COMPANY, BAKER CITY, ORE.



TRANSMISSION LINE, LOOKING TOWARD BLUE MOUNTAINS.

The second transmission runs to Bourne, thirteen miles southwest across the main summit of the Blue mountains into the Cracker Creek mining district. This line reaches an elevation of 8,300 feet. The poles were taken from the surrounding timber. The country is so rough that all line material had to be delivered by pack horses. The poles are tamarack and black pine. Above 6,500 feet elevation there were no suitable poles and poles had to be snaked up the mountain at a very heavy expense. The poles are thirty feet long with eight-inch tops set five feet in the ground. A large number of the pole-holes were blasted in rock. The poles are spaced forty-five to the mile, except in difficult places. The top wire is carried on a spe-

cial bracket bolted to the side of the pole at its top. The other details are the same as those of the line to Baker City.

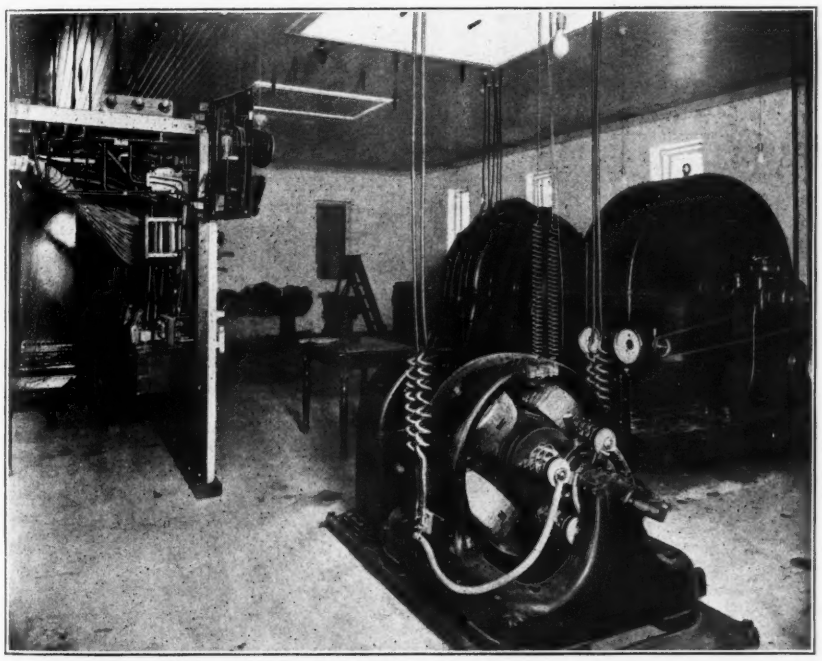
There is a branch line five miles long tapping the Baker City transmission line supplying power to the United Elkhorn mines and a second line of the same length running from the substation at Baker City, five miles east, to the Virtue and several other mines.

The substation at Bourne is a frame building twenty by thirty feet, cemented inside and out on expanded metal lath, with a concrete floor. Ten feet of one end is partitioned off for a room for the station attendant. There are two 200-kilowatt transformers connected in delta with the usual arrangement of lightning arresters and switchboard. Three-phase current at 2,300 volts is delivered to the various mines.

The principal substation is in Baker City. This consists of a two-story brick building near the business centre. It contains two 200-kilowatt transformers connected in delta. The station is equipped with automatic remote-control, high-tension switches in brick cells, a marble switchboard and high-tension lightning arresters. An extra 200-kilowatt transformer is on hand in case of breakdown either in this station or at Bourne. The gas works are owned by this company and are built on the same plat of ground so that the gas maker acts as substation attendant. This substation is the distributing point for the power line from the steam plant at South Baker, the line to the Virtue mines and the local service, which last is at 2,300 volts.

The officers of the company are: President, Clarence M. Brown, Philadelphia, Pa.; vice-president and general manager, Isaac W. Anderson, Spokane, Wash.; secretary-treasurer, J. M. Rhodes, Jr., Philadelphia, Pa.; assistant secretary and treasurer, F. N. Averill, Baker City, Oregon; superintendent, F. N. Averill, Baker City, Oregon.

G. L. Thayer, Walla Walla, Wash., is the consulting engineer to whom credit is due for the data given herewith.



ANOTHER VIEW IN THE ROCK CREEK POWER-HOUSE OF THE BAKER LIGHT AND POWER COMPANY, BAKER CITY, ORE.

MOTOR LOADS IN SMALL TOWNS.

BY HOWARD S. KNOWLTON.

The small town is often looked upon as a poor field for profitable power service, and in many such communities the central station output is entirely confined to lighting work during the hours of darkness. The equipment stands idle anywhere from twelve to eighteen hours per day, and the all-day load factor shrinks to fifteen or twenty per cent. Lighting rates have to be high to carry the burden of fixed charges during non-productive hours, and the business in general suffers from the paralysis of the equipment during the daytime.

In a town where more or less manufacturing is carried on, there is seldom any excuse for failure to supply current in the daytime. If there are several mills in the place driven by steam power with the usual accompaniment of wasteful and inflexible belts and line shafts, the field for aggressive motor applications is clear. Communities of this character are frequently so conservative that even a low power rate does not attract the mill people, but sometimes a start can be made in equipping a single department or an extension. Even if a mill has an isolated plant it should not be lost from sight, for the capacity of most isolated plants is much more limited than the capacity of the central stations operating in the same territory. Extensions are now planned by mill owners many months ahead of their construction, and if a motor load can be inaugurated in such cases as an entering wedge, the result is likely to be a greatly increased output for the central station. Increased production by individualized department or machine drive is the point to emphasize even more than operating economy.

As an actual fact there is more power business in a small town than is generally realized, even in towns where very little manufacturing is done. There are coffee mills in grocery stores, grindstones, blacksmith blowers, feed cutters, circular saws, small pumping plants for private use as well as small municipal pumping equipments, meat choppers, small refrigerating plants, church organ blowers, milk shakers, soda fountain carbonators, ice cream freezers, newspaper presses and elevators awaiting the motor drive. Very few communities are fully supplied with electric power for these purposes, but depend upon either muscular effort or non-condensing engines for their operation. The fan motor field is almost untouched in many small towns, and the proper ventilation of halls and churches is unknown to not a few communities. One of the best things which can be done to raise the standards of living in small towns above the dead level of rural monotony is to introduce electrical conveniences in every possible way. The improvement of station economy resulting from a better load factor is by no means the sole reason for the inauguration of daylight service by central stations in small towns; the increased volume of profitable business as a whole is a benefit to the town as well as to the operating company. It sometimes happens that the establishment of day service in a small town brings in additional factories, and thus increases the prosperity and purchasing power of the community. These plants can be most economically operated by the electric drive when rates are reasonable, and by being in a position to supply such service the small central station becomes a factor in the building up of the place. Power rates of four or five cents per kilowatt-hour are well worth considering in such cases.

The Electrical Works of the Allis-Chalmers Company.

THE name Allis-Chalmers, for many years a synonym among power users for excellence of design and workmanship in the construction of steam-driven engines of all kinds, has, within the past few years, come to be more and more associated in the public mind, not only with the production of the reciprocating steam engines, but also with the design and construction of prime movers and power equipment of every description —steam turbines, gas engines, hydraulic turbines and electrical machinery.

The electrical works are located at Norwood, a suburb of Cincinnati, Ohio, and comprise the original model plant of the Bullock Electric Manufacturing Company, with extensive additions which have been and are being made by the Allis-Chalmers Company in order to provide adequate facilities to meet the rapidly increasing demand for space. Electrical generating, transforming and driving apparatus of every type is built here, including direct-current dynamos and motors, alternating-current generators, induction motors, transformers, rotary converters, railway motors, air-brake motors, controllers, switchboards and a great variety of auxiliary apparatus.

The plot of ground on which the works have been built is approximately sixteen acres in area and is situated in close proximity to the tracks of the B. & O. and C., L. & N. railways as indicated in Fig. 1, showing the general plan of the works. All of the main buildings are of modern iron, steel and brick or concrete construction, exceedingly well lighted and ventilated. As a group, the buildings of this plant present an appearance which is above the average, being faced with buff-colored pressed brick and designed exteriorly with considerable reference to a pleasing architectural effect. As shown in Fig. 1, all buildings, with the exception of the foundry, face on Forest avenue, and are provided with wide and well-kept grass plots between the pavement and the building proper. Figs. 2, 3 and 4 are general views of the administration building, and the principal works buildings, with the exception of the pattern shop and the foundry, which are located opposite the main group.

The foundry building, an interior view of which is shown in Fig. 5, is 202 feet long by 103 feet wide. The structure is so arranged that it may be readily extended in the rear toward the pattern storage building if a larger capacity is at any time required. The foundry is equipped with two cupolas, with a capacity each of twelve tons per hour. The main bay of the foundry is served by two electric traveling cranes of twenty-five and fifteen tons' capacity, respectively. Each of the side bays is served by a smaller five-ton crane. Coke-heated core ovens are employed for the treatment of cores and moulds.

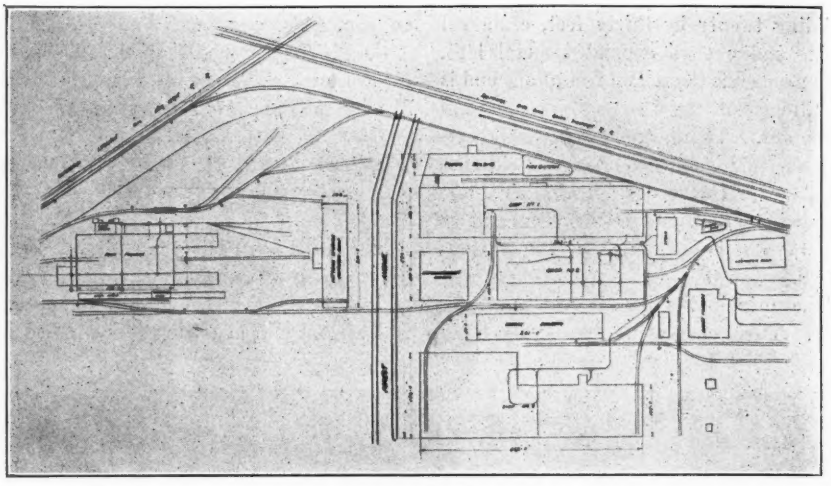


FIG. 1.—GROUND PLAN OF THE NORWOOD, CINCINNATI, WORKS OF THE ALLIS-CHALMERS COMPANY.

The second building opposite the main buildings, and facing them, is the pattern shop and pattern storage. This building is new and of modern construction throughout. It is fifty-three feet by 216 feet and four stories in height. The slow-burning mill type of construction has been followed, the floors being of heavy timber with no openings of any description. A tower in the rear of the building contains the elevator, staircase and main electrical wiring. There are no openings from this tower directly into the various floors of the building, but at each landing a fireproof sliding door leads into the main building. The heating system is carried out by means of the hot blast, all the air ducts being built in the walls, thus avoiding the use of galvanized-iron pipes. Each floor consists of a single large room, the two upper ones being provided with suitably numbered racks for storing patterns. The storage capacity is approximately 30,000.

FIG. 2.—ADMINISTRATION BUILDING, SHOP NO. 2 AND SERVICE BUILDING, NORWOOD, CINCINNATI, WORKS OF THE ALLIS-CHALMERS COMPANY.

The second floor is used as a pattern shop, providing room for forty pattern-makers. The most approved forms of woodworking machinery comprise the

equipment, each tool being driven by an individual electric motor, permitting the most advantageous placing of tools wherever most effective and doing away with all line shafting.

All parts of the building are exceptionally well lighted, as the rooms are comparatively long and narrow, with windows on all sides and with the interior walls coated in white.

The first floor is used as a storage room for small dynamos and motors carried in stock. It is divided into two bays running the entire length of the building and separated by a line of columns which, together with other columns at the side walls, carry the runways for two five-ton traveling cranes. Freight cars can be run into one end of the building on a depressed track and material can thus be loaded or unloaded directly.

Machine shop No. 1 of the main group, opposite the pattern building just described, is one of the original Bullock buildings, 102 feet by 462 feet. The equipment throughout is composed of motor-driven machine tools of all kinds used in the manufacture of electrical apparatus. Several different applications of the motor drive used are shown in Figs. 6 and 7. The building is identical in general appearance and construction with the others of the group. The central bay is served by two cranes of twenty and thirty tons' capacity respectively, and the side bays each by a five-ton crane. In addition to the machine tool work performed in shop No. 1, a portion of the armature winding for large machines is carried on here, and a testing department for the smaller machines has been provided in the front portion of the building. The Allis-Chalmers motors, used to drive the machine tools, are operated on the multiple voltage system of variable speed control having a speed ratio of six to one, giving twelve speeds in the forward direction and nine in the reverse.

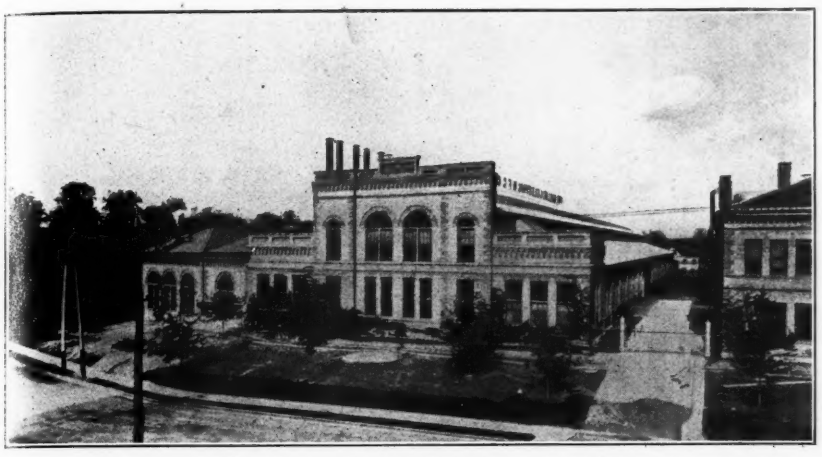


FIG. 3.—SHOP NO. 1 AND POWER-HOUSE, NORWOOD, CINCINNATI, WORKS OF THE ALLIS-CHALMERS COMPANY.

FIG. 4.—FRONT END OF SHOP NO. 3, NORWOOD, CINCINNATI, WORKS OF THE ALLIS-CHALMERS COMPANY.

In each machine shop, there is a separate balancer installed for splitting the voltages and which may be used independently in case of the failure of those installed in either of the other shops. The connections of these balancers are such that one set may be made to carry the load of the others.

Machine shop No. 2 is identical in general appearance with the other buildings of the group. It is 100 feet by 303 feet and two stories in height. The roof has a wide skylight area which secures a flood of diffused light to the interior of the building. This unit, with the others of the group, is also heated by means of the overload blower system which draws in fresh air, and having passed it around steam-heated pipes, blows it out through the tubes. This same system keeps the shop at an even and agreeable temperature in summer by the circulation of cooled air.

A five-ton electric traveling crane serves the entire length of the shop. An industrial railway connects the punch department with the annealing. At both ends of the shop freight elevators driven by electric motors connect the upper and lower floors. The drying ovens are also connected directly with the insulating department by means of a smaller elevator.

On the first floor is located the punching department where the sheet steel punchings for armatures and field-poles are made. This shop is provided with a complete equipment of motor-driven punch presses. On this floor the armature cores for direct-current dynamos and motors, and the stator cores for small alternating-current machines, are assembled. The commutator department is located at the rear, and in a room separated from the remainder of the building by fireproof walls the punchings for armature and stator cores are annealed and japanned.

The annealing equipment consists of two ovens arranged for oil fuel, each oven with a capacity of about 30,000 pounds of steel at each charging. Those ovens are of latest design, provided with recording pyrometers and arranged so that the heat is under complete control at all times. The upper floor of shop No. 2 contains the

coil-winding department where armature, field and transformer coils are wound and insulated.

In this shop every machine tool, from the ponderous drill presses, making laminations for turbo-generators, to the small tapping machines for insulating armature coils, is driven by an individual electric motor. The initial cost of many of the smaller tools is somewhat increased by driving each separately; but by this arrangement the machines are rendered independent of each other, so that an accident to one does not interfere with the operation of the others. The system becomes also extremely flexible. Not only can the tools be moved to the work, when it is desirable to do so, but they can be shifted easily from one portion of the shop to another without disarrangement of the power connections. Other advantages are clear headroom, better light, freedom from dirt, economy of operation (as power is only used when the machines are working) and reduction of the liability of accidents to employés. The greatest advantage to be derived from this individual drive, however, is the increased output due to the fact that the machines can be run at the proper speeds to suit the work. As labor is the greatest single item of expense in a machine shop, a very small percentage of saving in its cost per year will more than balance a comparatively large initial

FIG. 6.—VIEW IN SHOP NO. 1, SHOWING ROW OF MOTOR-DRIVEN BORING MILLS, NORWOOD, CINCINNATI, WORKS OF THE ALLIS-CHALMERS COMPANY.

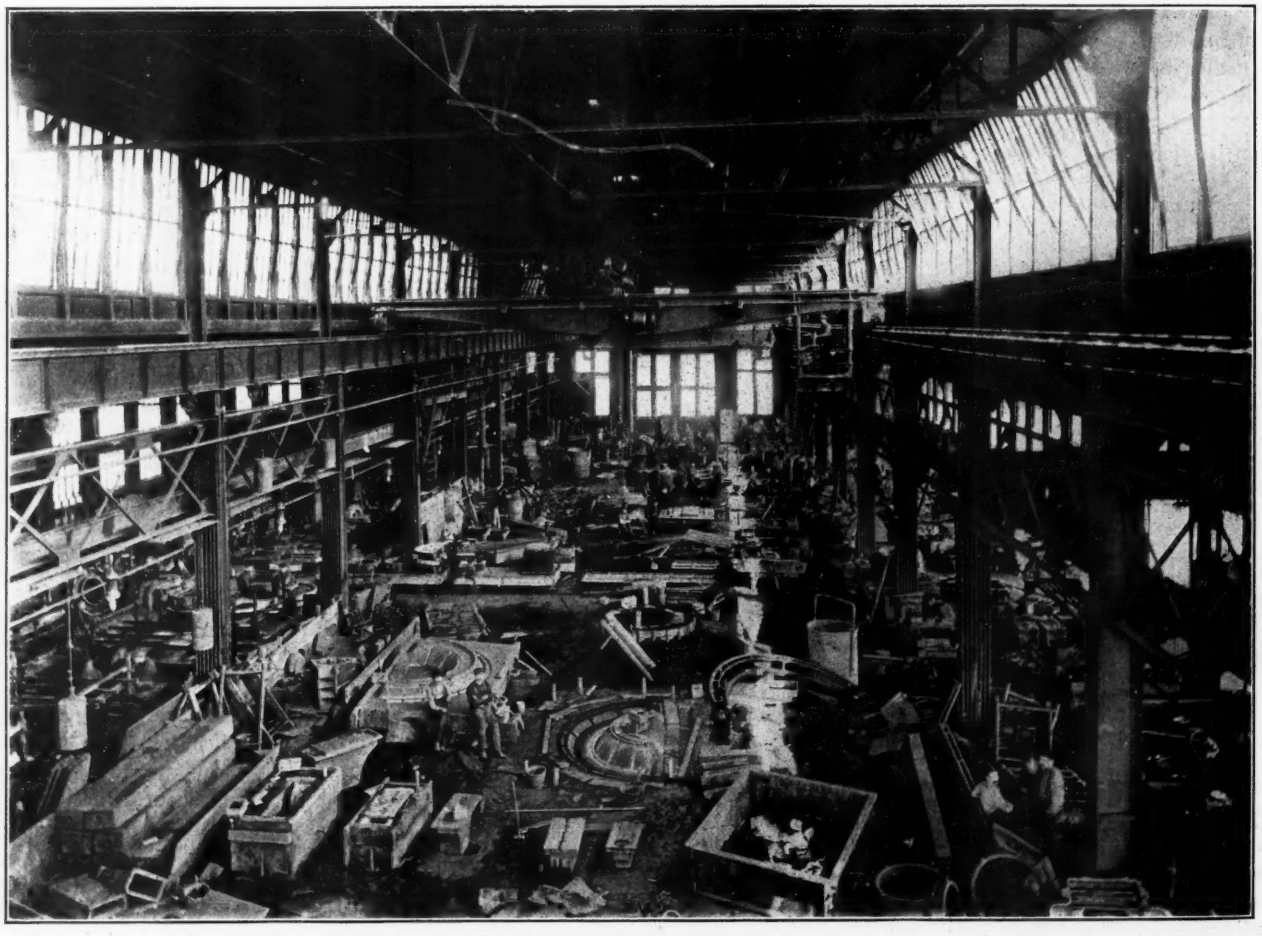


FIG. 5.—VIEW IN FOUNDRY, NORWOOD, CINCINNATI, WORKS OF THE ALLIS-CHALMERS COMPANY.

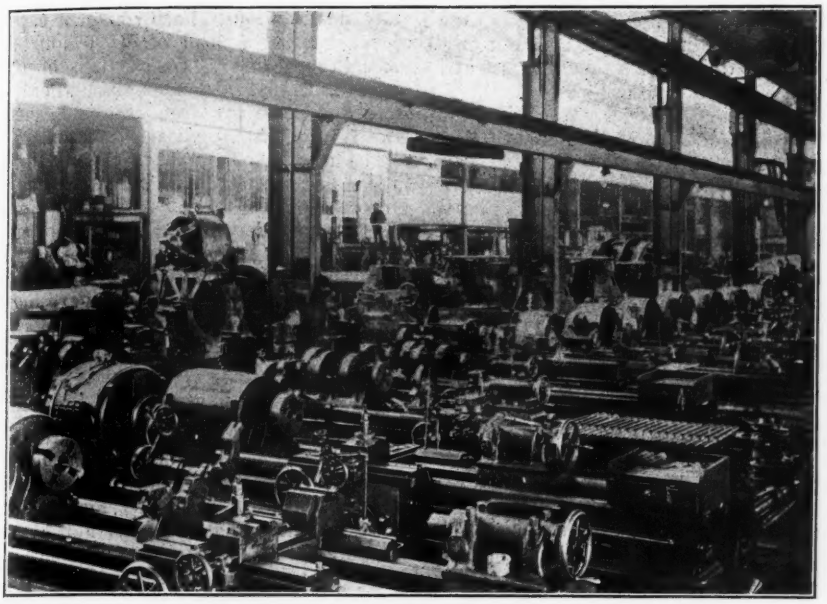


FIG. 7.—VIEW IN SHOP NO. 1, SHOWING MOTOR-DRIVEN LATHES, NORWOOD, CINCINNATI, WORKS OF THE ALLIS-CHALMERS COMPANY.

increase in the expense incurred for tools. Shop No. 3, a general view of which is shown in Fig. 8, is 462 feet long, the front portion being one story high and 176 feet wide, the rear portion 107 feet wide and two stories high. The two-story extension in the rear is a recent addition; it is of ferro-concrete construction and is faced with brick on the outside to match the other buildings. Both upper and lower floors are divided into bays by rows of columns, and on the lower floor two ten-ton cranes are provided; the work on the upper floor being of a lighter character, two five-ton cranes are installed. An elevator is located at about the middle of the extension. On the second floor are the tool room and brass department for the manufacture of small brass parts entering into the construction of machines. The front portion of this unit is used for the construction of large machines and is divided into three bays. The central bay is sixty-eight feet wide and sixty feet high under the roof trusses and is equipped with a sixty-ton traveling crane having a fifty-foot lift. Each side bay is forty-eight feet wide, one served by a twenty-ton crane and the other by one of thirty tons' capacity. Part of the central bay is provided with iron floor platens for the use of portable drills, slotters, etc.

The power-house and boiler plant of the

FIG. 8.—INTERIOR VIEW OF SHOP NO. 3, NORWOOD, CINCINNATI, WORKS OF THE ALLIS-CHALMERS COMPANY.

works are located alongside of shop No. 1. The power-house equipment consists of two Allis-Chalmers 800-kilowatt, 240-volt direct-connected engine type generators, one of which is driven by a Lane & Bodley engine, and the other by an Allis-Chalmers Reynolds cross-compound Corliss engine. There is further equipment consisting of a small 100-kilowatt unit and an air-compressor outfit used for operating pneumatic tools used in various operations throughout the shops. Two artesian wells furnish the entire water supply for engines and fire service. A water storage reservoir is provided for use in fire, with a fire pump in connection with a complete sprinkler system for all buildings. The engines are run non-condensing. The boiler house equipment is comprised in six 250-horse-power Cahall vertical, water-tube boilers, fitted with Mansfield chain grate stokers.

The service building, fifty-three feet by 261 feet, is located between shops Nos. 2 and 3. A wire storage room and locker and wash rooms for employés occupy its lower floor. The upper floor is fitted up as a dining room for factory and office employés.

The administration building is 100 feet by 100 feet and two stories in height. It provides accommodation for the various administrative offices and departments, drafting room, engineering department, purchasing department, superintendent's office, etc.

The general plan of buildings and grounds shown in Fig. 1 gives the layout of standard-gauge railroad tracks in yards and buildings. In addition, there is a complete equipment of narrow-gauge industrial railway interconnecting the various shop units. All the yard track is equipped with overhead trolley, and motor-driven cars equipped with electrically operated jib cranes are used for loading and unloading material and conveying it between the shop buildings.

The National Electrical Contractors' Association.

The sixth annual convention of the National Electrical Contractors' Association will be held at Cleveland, Ohio, July 18, 19 and 20. The Hollenden Hotel has been selected as headquarters. At present the indications are that this will be a well-attended and successful convention. The master of transportation, Alexander Henderson, has been doing a giant's work in securing liberal concessions from the passenger departments of the various railroads. Beginning with March 1, eleven bulletins have been published up to June 26. These bulletins have given every conceivable kind of information concerning railroad affairs, hotel headquarters, hotel rates and instructions concerning the method of applying for and utilizing railroad certificates where a rate of a fare and a third has been conceded.

The Central Passenger Association, the Trunk Line Association, the Western Passenger Association, the New England Passenger Association and the Southwestern Excursion Bureau have all made liberal concessions to members attending the convention.

For the convenience of passengers from New York and adjacent points, arrangements have been made with the New York Central & Hudson River Railroad for a special Pullman equipment, leaving New York (Grand Central Station), July 17, at 5.29 P. M., arriving in Cleveland, July 18, at 6.55 A. M.

Gas Engine Ignition.

In an article by L. W. Scudder, in the *Yale Scientific Monthly* for June, on "Some Disputed Points in Automobile Manufacture," the author compares the advantages of the two electrical ignition methods. The majority of American manufacturers use the jump spark system, with a length of spark about one-thirty-second of an inch. The make and break system is used on nearly all of the foreign cars and on one or two American machines. The make and break system gives but a single spark, so that if this fails there is no chance for ignition until the next stroke. The points of contact are liable to wear out quickly on a high-speed engine, and their renewal is difficult and expensive. With this system it is impossible to start the engine without cranking. The greatest trouble met with in the jump spark system is due to the breakdown of the insulation. The spark plugs necessary for this system are a source of endless annoyance, and the induction coils and their vibrators are apt to give trouble. The author concludes that where the cost of the system is not of much importance, the make and break plan is the better, but where the apparatus must be left to the care of less skilled workmen and must be less expensive, the jump spark gives better results.

Opening of the Teltow Canal.

The ceremony of opening the new Teltow canal was performed by the German emperor on Saturday, June 9. The canal has been constructed and will be worked entirely by the municipal authorities of Teltow, the total cost of construction having amounted to about £2,000,000. The greatest feature of the canal is that electric towing will be exclusively adopted, and barges will not be allowed to be propelled in any other way. Electric towing locomotives are used, running on rails on the banks and supplied by an overhead wire. A special power station has been erected near the canal containing two generating sets, each driven by a 1,000-horse-power Zoelly turbine. Three-phase current is generated at 6,000 volts, fifty cycles, and is converted to continuous current at 600 volts in substations. Each tractor is capable of hauling a load of 1,500 tons at 3.3 miles per hour. On portions of the canal which pass through lakes, where it is impossible to tow from the bank, electrically propelled tug-boats are used.

The new Teltow canal is twenty-three miles long, sixty-six feet wide, and has a uniform depth of rather more than eight feet, thus permitting the passage of barges laden with as much as 600 tons of cargo. It is spanned by forty-two bridges, and when finally completed, will have cost nearly two millions sterling.

Flour Bleaching with the Aid of Electricity.

An interesting and useful application of electricity which is finding considerable favor in the milling trades is described in the *Electrician* (London) for June 8. It is essential that flour should be of the purest white color, and various bleaching processes have been employed from time to time, to which the flour is subjected after being ground. The latest of these is that due to the Alsop Flour Process Company, of London, which has been in use for the past two years.

The method consists briefly in passing a current of air through a chamber containing a high-voltage, continuous-current arc. This is then led through the flour, which has been placed in an agitator, and the flour emerges from the agitator with a considerably whiter tint that it had previously. The company explains that the air is ionized in its passage through the arc chamber, and that ionized air has a distinct bleaching action on flour.

The arc is formed in a peculiar way. A double-acting pump draws air through the arc chamber, the piston of the pump at the same time drawing out the arc. The electrodes between which the arc is struck are usually mild steel, and are insulated from the wall of the chamber. They are arranged to fit snugly in the holder, but can be easily replaced. When the suction stroke of the pump starts the electrodes are together, and as the stroke proceeds they are separated and the arc is lengthened by raising the upper electrode until it is extinguished. During the pressure part of the stroke which forces the air through the bleaching chamber the electrodes are brought together again. The rocking arm which operates the electrodes in the two chambers has a travel slightly greater than that taken by the electrodes, the difference in motion being taken up by a spring.

The voltage employed is 400, and to increase the length of the arc an inductance of considerable size is included in the circuit. The arc is from two to five inches in length, according to the size of the drum. The current employed ranges from one and one-half to twelve amperes, according to the amount of flour to be treated, or the degree of bleaching required. With a double pump, running at fifty revolutions per minute, and having pistons ten inches in diameter with ten inches stroke, thirty sacks of flour can be treated in one hour.

The Second Annual Convention of the National-Interstate Telephone Association.

Auditorium Hotel, Chicago, Ill., June 26-28.

THE second annual convention of the National-Interstate Telephone Association was held at the Auditorium Hotel, Chicago, Ill., June 26, 27 and 28. In point of attendance and enthusiasm this was the most successful independent telephone convention ever held. As published in the last issue of the ELECTRICAL REVIEW the manufacturers made a splendid showing and, as usual, helped materially to make for the success which was attained.

TUESDAY SESSION—JUNE 26, 3 P. M.

The first session was called to order June 26, at 3 P. M., with President James B. Hoge in the chair. Mr. Hoge presented J. Hamilton Lewis, corporation counsel of the city, who delivered the address of welcome.

Following the address of welcome a photograph was made of those present, and the response was made by E. H. Moulton, president of the Twin City Telephone Company, Minneapolis, Minn.

JAMES B. HOGE, PRESIDENT.

President Hoge then delivered the annual address, saying, in part:

The securities of our companies are now regarded in an entirely different light from what they were two years ago or even one year ago, and the investing public are analyzing them critically, finding them in most cases more conservatively financed and upon a more substantial basis than many of the securities that have heretofore been selling at much higher prices than our securities.

A great majority of the companies to-day are using the best material and the latest type of equipment to be had; operating rules and regulations, systems of accounting, and systems of advertising have all become more uniform, and yet, when you stop to consider the possibilities ahead of you in this great work, you will see that you have more victories to win, many problems yet to solve. It has been well said that no other public-serving utility, except the water companies, fills so important a place in the daily life of the American people as the telephone.

We represent to-day an investment of over $300,000,000, with over 3,000,000 telephones installed. Let this coming year be one of education along organized lines. Let us help our neighbors as well as ourselves. The next ten years will see over 3,000,000 additional telephones connected with our systems if we do our full duty. Strong interests are coming into the field each month. We are getting young men of wealth and influence interested who are following their money into the business in a way that is a power for good. But a greater power for good is the fact that the masses are investing their money in these properties, and it is their property that is furnishing this service in their community, the same as it is their money that is furnishing the banking capital of their community and they are going to lend their influence in seeing that the business is run on proper lines to give good service and fair returns upon the money invested. What we need to-day is a better and stronger organization, provided with sufficient capital to prepare records of our system, to carry on a campaign of publicity and furnish to the press the information that they desire about the greatest industry ever developed in this country.

President Hoge announced the following committees:

Committee on ways and means—J. G. Splane, Pennsylvania, chairman; R. B. McPherson, Michigan; Henry Barnhart, Indiana; James S. Brailey, Ohio, and Charles E. Sumner, Oregon.

Committee on amendments to constitution—Cyrus Haling, Ohio, chairman; Senator Kline, Pennsylvania; J. B. Ware, Michigan; J. B. Earl, Texas, and E. R. Conkling, Illinois.

Committee on nominations—E. H. Moulton, Minnesota, chairman; O. C. Snider, Missouri; M. B. Overly, Kentucky; W. G. Thompson, Ohio; P. C. Holdoegal, Iowa.

Photograph committeee—George F. Hughes, Iowa, chairman; R. E. Mattison, Nebraska; Wm. L. Morlering, Indiana. This is a special committee that was appointed this year in order to take charge of certain exhibits of photographs of exchanges and equipment in various states. This exhibit was one of the features of the convention.

Committee on credentials—A. C. Davis, West Virginia, chairman; Louis Bruckner, Ohio; A. C. Lindemuth, Indiana; Linton Reber, Maryland, and Louis Blankenhorn, California.

Entertainment committee—C. E. Stiger, Illinois, chairman; George Ihmsen, E. B. Overshiner, J. Y. Cracraft, W. H. McDonough, W. W. Dean, C. D. Norton, H. B. McMeal, J. F. Bailey, C. Y. McVey and George N. Bandy.

THEODORE GARY, FIRST VICE-PRESIDENT.

John A. Harney, assistant secretary, presented his report, an abstract of which follows:

There are 7,450 independent telephone companies, operating in 11,925 cities and towns of the United States. There is a handsome balance in the treasury, and the supply department shows a fair profit. Concerning the progress the association is making in the preparation of maps of the independent lines, there are at present on file post-route maps for forty-two states. On twenty-nine of these data have been spotted and tracings have been completed for seventeen.

WEDNESDAY SESSION—JUNE 27, 10 A. M.

The convention met pursuant to adjournment, the president, James B. Hoge, in the chair.

The secretary proceeded to the roll-call

of states, the representatives giving various details concerning the condition of affairs in their territories. Alabama made no response and Mack Hammett responded for Arkansas.

Telephone rates are uniformly $1.50 and $2.50, the largest places $2 and $3, extension rates $1. Toll rates are about three-quarters of a cent per mile; a usual minimum charge of twenty-five cents is made. It is impossible at this time to say definitely what the earnings of the toll lines would be, because the business is as yet undeveloped, but the actual figures from the sub-license company show that the average toll line business varies between $8 and $9 from a subscriber per year. This large percentage is due to the cotton planters of the state who reside in the country, and who frequently have recourse to the telephone for business and pleasure, and especially to expedite their business. The negro farm hands on the plantation also use the telephone, and there being quite a number, this naturally increases the earnings. The independent telephone companies are situated at the following places in Arkansas: Texarkana, Pine Bluff, Carlisle, Little Rock, Russellville, Adkins, Ozark, Altus, Fort Smith, Eureka Springs, Bald Knob, Walnut Ridge, Black Rock, Imboden, Horning, Paris, Rector, Pigott, and Elton, with a total number of subscribers of 6,305.

For California Louis Blankenhorn stated that the independent companies are now reaching into the northern part of the state, to San Francisco and Oakland. Oakland is nearly built, and will be in operation in the course of six months, probably, in any event, starting with 5,600 subscribers. San Francisco has given a franchise to the Home Telephone Company, and they will start in there with 15,000 at least, but will probably exceed that in their initial installation. The Southern California business is represented by now close to thirty companies, representing, perhaps, ten millions of capital.

Prices range from a minimum for house telephones, individual lines, of $1.50 to $5, the extreme limit in the city of Los Angeles for business telephones, in outside cities from $3 to $2.50.

Theodore Gary, upon permission, as a special order of business, presented a recommendation from the executive committee admitting manufacturers to membership in the association. After considerable discussion this matter was placed in the hands of the committee on constitutional amendments.

Proceeding with the roll-call of states, Mr. Norton replied for Indiana. There are 400 companies, 15,000 stockholders, 200,000 independent telephone subscribers, and $20,000,000 of capital invested.

For Iowa P. C. Holdoegal stated that in Iowa they have been somewhat active during the past year, have placed a state agent at a salary in the field, and are realizing the benefits from these efforts. The independents have increased about ten per cent, and are now reaching practically every point in the state, and the long-distance toll lines before the summer closes will reach every corner, so that practically the subscribers in each community may talk to those in every other community in the state.

For Kentucky Mr. Cole stated that from 1,500 and 2,000 towns are supplied with independent telephone exchanges. Recently the long-distance developments have begun in good earnest, until now they can connect from the western to almost the remotest eastern portion of the entire state, and a company has been organized recently to devote itself more especially to the betterment of the long-distance lines of the state.

JOHN A. HARNEY, ASSISTANT SECRETARY.

For Michigan J. B. Ware stated that Michigan has at the present time over 80,000 independent telephones. Six years ago at the time the Detroit company sold to the Bell and the Kalamazoo company also sold, some 10,000 telephones were taken out of the independent ranks, leaving less than 30,000 so that during the past six years the greatest portion of the territory has been redeemed.

For Missouri W. B. Scruggs stated that they have districted the state and organized every district except one. There is only one part of the state that is not fully organized in districts, and working with the state association. They claim some 50,000 units in Missouri, and an independent company in nearly every town in Missouri in operation to-day. Springfield will be developed soon, and St. Joe will be entirely rebuilt within the coming year.

For Nebraska R. E. Mattison stated that Nebraska operates 265 independent telephone exchanges. This development has been accomplished in the past six years. They have about 4,000 toll lines. The state association represents 43,000 telephones, and is organized on the Ohio plan.

For Illinois C. V. Cheadle stated that Illinois has a well-organized independent telephone association. It is comparatively new. It has very little history back of it, but they have a wonderful, fertile future ahead. In round numbers there are approximately 160,000 independent telephones. There are probably sub-licensee companies representing over 30,000, so that there is approximately 200,000 independent telephones in the state.

For Canada Dr. J. F. Deners stated that in the Province of Quebec they have 2,750 miles of toll line construction. There are now around 3,000 subscribers, and the main line is 300 miles along the St. Lawrence river, with a copper circuit. In the province there are about twelve independent telephone companies, with a capital each invested of from $2,000 up to $350,000. The total amount of money invested in the province is about $1,000,000. The total amount of subscribers is about 7,000.

For Ohio F. L. Beam reported that the independents had 248,304 telephones in service, 797 exchanges, 1,705 toll stations, a growth in the past twelve months of over 54,000 telephones.

For Oregon Charles E. Sumner reported that there has been organized the Home Telephone Company, of Portland, for the purpose of building an exchange in the city of Portland; a second company, known as the Home Telephone Company, of Puget Sound, for the purpose of building in the cities of Tacoma and other cities of that district; a third company, known as the Home Telephone Company, of Spokane, has been organized for the purpose of building in the cities of Spokane and Walla Walla; a fourth company, known as the Long Distance Telephone Company, has been organized for the purpose of covering the entire two states, and connecting all the exchanges in the entire two states with long-distance lines.

For Pennsylvania Senator Kline reported that there are in operation with

companies belonging to the state association 150,000 telephones. There are 25,000 miles of toll line, with about 300 exchanges, and 2,486 toll stations.

WEDNESDAY SESSION—JUNE 27, 2.15 P. M.

The secretary called the roll of states for those who had not responded at the previous sessions, Alabama, Alaska, Arizona, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Indian Territory, Louisiana, Maine, Maryland, Massachusetts, Nebraska, Missouri, Mississippi, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Rhode Island, South Carolina, Tennessee and Texas making no response.

For West Virginia Mr. Davis stated that there are twenty-six companies in the state association, with an invested capital of $1,244,000 and gross receipts are $67,416.

For Vermont Mr. Buzzell reported there are over 100 independent companies in the state, with about 20,000 telephones.

For Texas J. B. Earl reported that at Austin the independents have built several exchanges in the central territory and north of Austin there are two companies in connection with the independent company. The rates are good. The long-distance rates are much more.

For Wisconsin Mr. Webb reported that there are over 42,000 independent telephones in operation, but a considerable number are Wisconsin Bell licensees.

For Keystone Telephone Company, of Philadelphia, N. T. Folwell reported that they have conduits in 280 miles of street; all large buildings are directly connected to the conduit system; smaller buildings are connected from junction boxes on the rear of buildings, and in outlying districts, the only overhead construction is one pole in each block, reaching only the subscribers in the block. The company has only eighteen miles of pole line in Philadelphia county; less than three miles of aerial cable, and about 450 miles of underground cable. They have $500,000 invested in real estate and buildings in Philadelphia county, all of which are of the most substantial and permanent character, the larger ones being fireproof, and the smaller ones semi-fireproof. The territory is covered by six exchanges, the ultimate capacity of the three larger ones being 7,200 lines and the smaller ones 4,800 lines. Through the Keystone State Telephone and Telegraph Company they are operating in the counties surrounding Philadelphia in Pennsylvania. They have six exchanges in this territory and 3,000 miles of toll line connecting with the Delmarvia Telephone Company and the Maryland Telephone Company on the south, the United Telephone Company on the west, the Consolidated Telephone Company on the north, and the Interstate Telephone Company in New Jersey on the east. They have recently acquired the Eastern Telephone and Telegraph Company operating in Camden and Gloucester counties of New Jersey, and the Telephone Company of South Jersey operating in Cape May county. They are operating in Philadelphia and suburbs and in Camden 25,000 telephones and handle an average of 4,000 toll messages per day. The gross revenue of the Keystone properties is nearly $1,100,000 per year, and the demand for the service is greater than ever.

The paper by Ivy L. Lee, New York, on "Telephone Publicity—Appealing to Public Opinion," was read, and a vote of thanks tendered to the author.

The independent companies should recognize the necessity of securing the good will of the public. This can only be done by teaching it what the independent telephone companies have done and how strong they are. Only in this way is it possible to overcome the opposition in its stronghold. The public ear must be reached through legitimate news items published in the newspapers, items which are not paid for and which have the element of novelty. It was suggested that the association adopt a comprehensive policy for informing the people of the country of the achievements of the independent companies.

A resolution relative to the independent movement looking to an entrance into Washington, D. C., Chicago and New York city was introduced and adopted.

After a lengthy discussion upon the status of the Kellogg Switchboard and

A MEETING OF THE NATIONAL-INTERSTATE TELEPHONE ASSOCIATION, AUDITORIUM HOTEL, CHICAGO.

Supply Company, a resolution was passed recommending that members of the association not now using equipment made by that company refrain from purchasing such apparatus, and in the event of the company passing into the control of independent people the resolution to be void.

R. A. Walker, Iowa, read a paper, entitled "Look for the Shield." Mr. Walker made an earnest plea for the universal use by independent companies of the shield adopted as an emblem by the association last year.

THURSDAY MORNING SESSION.

The convention was called to order at 10 A. M. Thursday morning by President Hoge. The committee on standard operating rules and regulations reported progress and recommended that it be allowed to report at a later session which was done.

Charles S. Norton delivered an address entitled "Official Organs—National and State." In this he dwelt upon the powerful fighting machine which such an organ would be. The journal should be divided into departments devoted to the various branches of telephone work. He urged the association to take up the matter. The address was referred to the executive committee with power to act.

L. G. Parker read a paper entitled "Southern Toll Line and Exchange Development." This calls attention to the opportunities for telephone development in the South, and points out the present conditions, which seem to be very favorable for such development.

The report of the committee on amendments to the constitution and by-laws was read by the chairman, C. W. Kline. The committee has revised the entire constitution, making slight changes in nearly all sections. It seems that the present constitution has never been adopted, but it was taken as a basis for the amended form. The report was taken up article by article, and adopted, in some cases with slight changes. In Article I the name of the association is designated as the International Independent Telephone Association of America. The idea of the committee was to make the name inclusive, so as to admit Canada, Cuba and Mexico if they desire to come in. It is provided that an annual meeting shall be held within thirty days of June 1, and special meetings when decided upon by the executive committee. Article X, on membership, has been changed considerably. It is in two sections. Section I provides that any state, provincial or independent telephone association shall be eligible to membership in the association. Section II provides that manufacturers of independent telephone apparatus, manufacturers of cable and other telephone equipment, dealers in telephone apparatus, publishers of telephone magazines and telephone construction companies may become associate members.

It was moved and carried that copies of the new constitution be printed and distributed to the members.

The report of the committee on standardization of equipment was presented by E. E. Clement. The committee thought it impracticable and inadvisable to select one unvarying type of telephone equipment as a standard for all companies; but recommends that such details of apparatus as screws, lamp bases, etc., be standardized. A unit of carrying value for telephone circuits should be determined and adopted. It recommends that a permanent committee on physical standards be authorized and appointed. The report of this committee was discussed in a communication from S. G. McMeen, who agreed with its recommendations, and by I. H. Thiedick, Charles S. Norton, E. F. Wasson and L. Reber. The report was accepted and referred to the executive committee.

The report of the committee on standard forms of accounting was presented by Charles F. Bender. This divides the work into six parts: standard forms, classification of income, classification of construction, general accounts, operating accounts, and maintenance accounts. The committee did not feel itself competent to formulate a standard system of accounting, with the expectation that all companies would adopt it at once. Such an outcome would require some time, and it recommends that a permanent committee of five members be appointed to consider the matter further. The report was accepted and referred to the executive committee.

The report of the committee on credentials was read by the secretary. This recommends that delegates from a number of states, who have been properly certified, be seated. The report was accepted.

The convention then adjourned, to meet at 1.30 P. M.

THURSDAY AFTERNOON SESSION.

The convention was called to order by President Hoge. The report of the committee on standard operating rules and regulations, which had been held over from the preceding session, was submitted by Charles C. Deering. Mr. Deering called attention to the desirability of devising some method of handling and accounting for free business. This business is, in some cases, particularly heavy, and it is desirable that it should be carefully studied. The report suggests that a committee should be appointed to take the matter into consideration. The report was discussed by Messrs. John M. Baer and J. B. Ware favorably, and was adopted, the committee to report at the next meeting.

The following papers were ordered to be published: "Independent Advertising—Getting Results," W. B. Woodbury, Detroit, Mich.; "Revenues," by W. B. Humboldt, Topeka, Kan.; "Suggestions on How to Finance Small Telephone Property," by Theodore Gary; "Texas," by J. B. Earl.

A resolution was presented by A. C. Lindemuth, urging the mayor, the board of public works and the common council of the city of Evansville, Ind., to grant a franchise to the Citizens' Telephone Company. This resolution was sharply discussed by Messrs. Baer, Ware, Norton, Fisher and Thiedick. It was adopted in a modified form, in which the words, "an independent telephone company," were substituted for "the Citizens' Telephone Company." A number of those who took part in the discussion intimated that they would present similar resolutions with respect to other cities where independent companies were receiving franchises, and on motion of Mr. Baer, a similar resolution referring to Milwaukee, Wis., was adopted.

The report of the nominating committee was presented by P. C. Holdoegal. The following were the nominees:

President—James B. Hoge, Cleveland, Ohio.

First vice-president—Theodore Gary, Macon, Mo.

Second vice-president—Charles E. Sumner, Portland, Ore.

Secretary—Charles C. Deering, Boone, Iowa.

Treasurer—James G. Splane, Pittsburg, Pa.

John A. Harney was also nominated for the position of secretary by Mr. Ware, but he withdrew his name. The nominees were elected.

President Hoge thanked the association for its confidence in his administration, and urged upon the members unabated interest in its work.

On motion of George N. Bandy, Mr. Harney was recommended for appointment as assistant secretary. The motion was carried.

The report of the committee on photographs was presented by George T. Hewes. Fifty views of independent telephone buildings had been exhibited, and the following prizes were recommended:

Keystone Telephone Company, Philadelphia, Pa., first prize.

Lincoln Telephone Company, Lincoln, Neb., second prize.

Sioux City Telephone Company, Sioux City, Iowa, third prize.

Louisville Home Telephone Company, Louisville, Ky., honorable mention.

The report was adopted.

A motion was made and carried, that a thousand copies of the full proceedings of the convention be printed for distribution by the association. This has not been done heretofore.

The question box was then taken up, some of the questions being read by J. B. Rhodes. These are of a very varying character, a few of them being discussed briefly by members. One of the questions was, "How Should the Technical Schools Train Young Men for the Telephone Field?" This was considered at some length by A. B. Smith, of Purdue University, who outlined the work offered there and wished for an expression of opinion as to what should be the character of the instruction given to prepare young men for telephone work.

On motion of Charles S. Norton, which was adopted, a committee was appointed to wait upon the officers of large municipalities and present arguments in favor of independent companies seeking franchises. Those appointed to the committee were Messrs. Norton, Woodbury and Holdoegal.

Mr. Rhodes was authorized to edit and publish the question box.

The convention then adjourned *sine die*.

ASSOCIATION BANQUET.

The banquet of the association was held at the College Inn, "White City," on the evening of June 27. About 350 members were present and an enjoyable time was had. Colonel J. D. Powers, of Louisville, Ky., acted as toastmaster.

Illinois Independent Telephone Association.

The first annual convention of the Illinois Independent Telephone Association was held at Peoria, Ill., June 20 and 21. A feature of the session on June 21 was the address by F. Dagger, of Ottawa, Canada, on the subject of "Telephone Competition *versus* Monopoly." A paper on "Discipline in the Switchroom," was also presented.

The following officers were elected: president, E. R. Conklin, Aurora; vice-president, Manford Savage, Champaign; secretary, C. B. Cheadle, Joliet; treasurer, C. B. Hawkins, Decatur. Members of executive committee: E. R. Conklin, Aurora; C. B. Cheadle, Joliet; C. O. White, Princeton; J. W. Barrett, Pekin; Manford Savage, Champaign; C. S. Haskins, Decatur and W. S. Bassett, St. Louis.

New York Pay Station Telephone Rates.

As announced last February by U. N. Bethell, vice-president of the New York Telephone Company, a five-cent pay station telephone rate was made effective in each of the boroughs of New York city on July 1.

In laying out the territory in which a five-cent call can be made the companies have been liberal, in most instances the territories exceeding the borough limit.

For example, Manhattan and the Bronx have been divided into three districts. District 1 comprises the territory below One Hundred and Tenth street on Manhattan Island; district 2, Manhattan Island north of One Hundred and Tenth street, together with the two exchanges, Melrose and Tremont, in the Bronx. District 3 comprises all of the Bronx except the Melrose and Tremont exchanges.

According to the new rates all telephone calls within districts are to be five cents, and all calls to adjoining districts will be five cents. The only ten-cent charge in the two boroughs is for telephone calls between southern Manhattan and northern Bronx.

The borough of Brooklyn, together with Astoria and Long Island City, have also been divided into three districts in which a five-cent rate will obtain in the same manner. Rates between adjoining boroughs are ten cents. From remote points they are fifteen cents.

Seventh Annual Meeting of the National Electrical Trades Association.

The seventh annual meeting of the National Electrical Trades Association was held June 14 at the Hotel Imperial, New York city, representatives being present from affiliated local associations throughout the country. A number of members of the New York society were also in attendance.

At the business session lasting the whole afternoon important matters came up for consideration and reports were rendered by the delegates from the local asssociations showing them to be in a flourishing condition and becoming more and more potent in assisting the members to run down bad debtors. The general secretary's report was particularly replete with instances of the great good being accomplished by the affiliated bodies.

C. C. Sibley, of the firm of Sibley & Pitman, New York city, was elected president for the ensuing year; Geo. A. Cragin, of the American Steel and Wire Company, Worcester, Mass., was made vice-president, and Attorney Frederic P. Vose, local secretary of the Chicago association, was reappointed general secretary. Chicago was selected as next year's meeting place.

Immediately after adjournment of the meeting the party was transported in a large sight-seeing automobile to Coney Island where dinner was served and the mysteries of Luna Park and Dreamland were explored.

Railway Men Visit Schenectady, N. Y.

Delegates to the recent Saratoga Springs convention of the Street Railway Association of the State of New York visited Schenectady at the invitation of the General Electric and American Locomotive Companies. The party included some fifty members of the association and was in charge of Manager E. F. Peck of the Schenectady Railway Company, chairman of the entertainment committee, and other officials. Special cars furnished by the local railway company brought the guests to the city, where they were received by officials of the American Locomotive Company. After viewing the works, the party proceeded to the factories of the General Electric Company, where an informal lunch was served in the new Firemen's Headquarters building. The reception committee at the works of the General Electric Company included J. G. Barry, G. P. Haskins, G. H. Hill, E. D. Priest, Theo. Beran, manager of the New York office, F. H. Gale and others. After lunch the party spent the afternoon in viewing the works, leaving about 4 o'clock.

New York City Brings Suit to Get $5,000,000.

Corporation Counsel Delaney, of New York city, claims $5,000,000 from the Consolidated Telegraph and Electrical Subway Company and the Empire City Subway Company, Limited, for the city of New York, under the agreement entered into as a condition upon which these companies were given the exclusive use of the electric subways laid during the administration of Mayor Grant. The companies claim that they owe the city nothing. On June 27 Justice Giegerich, of the Supreme Court, upon the application of Assistant Corporation Counsel Burr, appointed Hamilton Odell, Eugene A. Philbin and Adrian H. Joline to take an accounting in the dispute.

As a condition for the electrical subway privilege, the two companies agreed to pay to the city all over ten per cent net profit earned under their monopoly, expenses of operation being first deducted. It is alleged by the city that this now amounts to more than $5,000,000. The companies' counsel, however, deny that they have ever earned anything like ten per cent.

Reviews of Current Engineering and Scientific Literature.

The Action of Radium on Gelatine.

In this communication John Butler Burke explains the experiments he has been conducting to determine the action of radium on gelatine and bouillon, and replies to certain criticisms made of his work. There is no doubt in his mind that subdivision takes place because of the nature of the cleavage. He believes that the radium salt produces ultra-microscopic bubbles, due to the gaseous emanation which it emits. These bubbles act as the nuclei of larger aggregates, due, no doubt, to direct chemical action on the surrounding medium, or to indirect ones brought about by the intense electromagnetic disturbances from the radio-atoms, as in the case of photographic actions. The cellular bubble and emanation will multiply as the emanation increases, since it will force its way through the cell walls at the lines of least resistance. Their mode of subdivision will be different from that of aggregates which divide up into clean-cut segments or sections, while the emanation cells retain their smooth surface, due to surface tension. It seems not improbable that the subdivision of natural cells is accomplished in some similar way, although not necessarily by radium. It seems probable that there is in the nucleus a substance with somewhat similar properties, but in a more or less marked degree, which enables the cell to perform this cyclic process, each portion possessing some of the original nuclear substance. His radiobes and the eobes noticed by M. Dubois, although differing in some respects, have enough in common to show that negative experiments and observations are not altogether to the point. It seems probable that in these negative experiments the salts used have been in excess, and that the microscope powers employed have not been high enough. The criticism that the action may be chemical, because similar effects will be produced by barium, seems not to cover the point, for it is to be expected that barium will behave in much the same way as radium. It has been found that sulphur must be present in the gelatine, otherwise no marked results will be obtained. Also, it should be noted that these bodies are soluble in warm water, and hence solutions of radium should not be employed. There is nothing fortuitous in this subdivision any more than there is in the subdivision of natural cells. These bodies are unquestionably a unique and highly developed form of cell. If they are organic crystalloids, as they resolve themselves into these, they are, at any rate, more remarkable than any of that type hitherto observed.—*Abstracted from the Electrician (London), June* 15.

A Current Interrupter for Roentgen Apparatus.

A method is given here by M. J. O. Januszkiewicz of constructing an interrupter for use in Rœntgen-ray work which overcomes the difficulties met in apparatus of other types. There are three features which must be possessed by a successful interrupter; it must be able to break fairly heavy currents up to, say, thirty amperes; it must be capable of being regulated so that the frequency of the break is under control and can be reduced to a fairly low number; and the breaking of the current must be gradual, although the opening of the circuit should be quick. The electrolytic current interrupters satisfy the first two conditions and are excellent devices because of their simplicity, but, unfortunately, they interrupt the current too quickly, and therefore are not entirely satisfactory. On the other hand, certain mechanical interrupters meet the last condition, but are defective in respect to the first two. Other things being equal, the length of a spark-gap varies inversely with the gas pressure. Wolff has shown that the following equation holds: $v=107.3p+79$, in which v is the sparking potential and p the vapor pressure in atmospheres. From this it is seen that by increasing the pressure of the vapor surrounding the spark that the rapidity with which the current is interrupted is brought under control and the length of break required can be varied. This therefore offers an easy solution of the problem. There is no difficulty in constructing the apparatus, because the breaking mechanism only need be enclosed in the pressure chamber, and high pressures are not necessary. It seems probable that the same principle can be employed for constructing an interrupter for use in wireless telegraphy.—*Translated and abstracted from Physikalische Zeitschrift (Leipsic), June* 15.

A Gasolene-Electric Motor Car.

A description is given here of an interesting gasolene-electric motor car constructed for the Hungarian government. About 200 of these cars are to be supplied. The car runs on two axles and is equipped with a direct-current generator driven by a four-cylinder gas engine. In this particular car the engine and generator set is placed across the car, though in later designs it will be placed longitudinally. The generator compartment contains all the switch gear and engine accessories. The voltage employed is 550, this being selected to enable the car to run over city electric railway systems without employing the generator set. The controller is a series-parallel device, and there are two motors, one geared to each axle. These motors are of the four-pole type and can be employed for braking, if necessary. The car weighs about eighteen tons, and will carry forty passengers. A car of this type, containing, however, two twenty-kilowatt generator sets in place of the one fifty-kilowatt set now employed, was tested recently at Árad, Hungary, giving the following results: The weight was about eighteen tons. At a speed of thirty-three miles an hour the power required was 20.3 kilowatts. The consumption of gasolene was 8.6 pounds per car-mile. At a speed of twenty-three miles an hour, nineteen kilowatts were required, and the consumption of gasolene was 9.8 pounds per train mile, the motor car in this case drawing a trailer, the total weight being 24.5 tons. During other tests, when the conditions were not quite so favorable, the tractive effort being greater, poorer results were obtained. At a speed of forty miles an hour the weight being eighteen tons, the power consumed was 19.1 kilowatts, and the consumption of gasolene, 8.75 pounds per car mile. During each of these trials a distance of seventy-seven miles was covered, and, in addition, the engine was run for seventy minutes while the car was standing. The trial car was subsequently put into service on the road, and it has made possible a considerable reduction in the force, while still running at a satisfactory profit.—*Abstracted from the Tramway and Railway World (London), June* 7.

A Method of Compounding Direct-Current Electric Stations.

Although the ordinary method of compounding direct-current generators gives fairly satisfactory results, a perfect characteristic is not obtained unless auxiliary appliances are employed. Further, with this method the parallel operation of generators in the same station and of two independent stations is not always easy, for such operation calls for a special adjust-

ment of the machines for each condition of running. It is possible to do away with the compound windings, replacing them by a booster, but M. A. Nouguier thinks that a still better way is to place the booster in the exciting circuit of the generators. In this way a much smaller booster is called for than if it were required to carry the whole output of the station, and by a special arrangement it is possible to obtain a straight line characteristic both for the generators and for the station as a whole. This plan also allows simple shunt generators to be installed. The plan consists in placing a resistance in the collector bus-bar, this corresponding to the so-called instrument shunt. Across this shunt are connected the terminals of the field circuit of the booster. The armature of the latter is connected in the exciting circuit of the generators. With such an arrangement and a shunt-wound generator, a characteristic is obtained which resembles that of a compound generator, it being concave toward the load axis. In order to correct for this, the motor driving the booster has series and shunt field windings connected differentially, the series winding being also connected across a shunt inserted in the collector bus-bar. By this means a speed characteristic of the driving motor is obtained which is just the reverse of the compound characteristic of the generator, being convex toward the axis of loads. The curvature of these two lines is, of course, due to the saturation of the iron of the two machines, and when the two curves are properly selected, the change due to saturation is just compensated for by the change in speed of the driving motor, giving a flat compound characteristic of the generator. When more than one generator is to be operated in parallel, a series of parallel shunts is inserted in the collector bus-bar, one for each machine, thus making it possible by cutting out one or more for the voltage of the station to be maintained constant, irrespective of the number of machines in operation. The method makes possible the operation of generators and of stations in parallel, without any special precautions. It merely calls for a booster set, each machine of which is small. It is applicable to stations already erected, and there is no danger of reversing the field of any generator.—*Translated and abstracted from L'Éclairage Électrique (Paris), May* 19.

Modern Tendencies in the Utilization of Power.

An interesting summary of the present situation in the utilization of power is given here by Professor J. J. Flather. Among other significant features of the present tendency in the development of automatic and labor-saving devices are the marked adaptation of compressed air and the application of electric power to machine driving. In the use of compressed air, facility of adaptation to various requirements which are, in many cases, additional to the supply of motive power, is a valuable feature peculiar to this system, and one which is susceptible of extension along many lines. The labor cost in most machine shops and in other works is so much greater than the cost of power that any expedient by which the labor cost may be appreciably reduced is justified, even though the efficiency of the agent itself be low. The introduction of the electric motor in machine shops and factories was at first looked upon with disfavor, but the innovation obtained a foothold, and advantages which were at first unforeseen were found to attend its use, so that it is being very generally adopted for a wide variety of work. A considerable difference of opinion exists as to whether individual motors should be used with each machine, or whether a number of machines should be arranged in a group. There are well-defined conditions to which each system is best adapted, but there are wide limits between which there appears to be no general rule, and both methods are employed. As far as efficiency of transmission is concerned, it is doubtful whether, in a large number of cases, motor-driving is in itself any more efficient than well-arranged engines and shafting. The principal object to be kept in mind is a desired increase in efficiency of the shop plant in turning out its product, with a reduction of the time and labor items, without a special reference to the fuel items involved in power production. An interesting feature of this application has been the demonstration that by means of special tool steels, higher speeds and more rapid work can be utilized than the machine itself will allow. The advantage arising from the use of these appliances has at times led to an injudicious extension, and occasionally one finds tools in use which require more attention than was formerly taken to do the work by hand. It has been proposed to use individual air motors in machine shops, but this use of compressed air seems entirely outside the pale of its legitimate field. The general experience thus far indicates that rotary air motors are not at all economical, and generally are not as satisfactory as electric motors. An interesting phase of the problem is the vast possibilities possessed by the modern combustion engine. While its use as a motor in industrial establishments has been somewhat limited, there is yet a marked tendency to employ the gas engine in manufacturing works, and a consideration of its advantages and cost of operation, together with its thermal efficiency and the possibility of still further improvement, indicates that for a great many purposes both steam engines and electric motors may ultimately be replaced by combustion engines. The high price of gas in this country has been one factor which has retarded the more common use of the gas engine. When it was discovered that blast furnace gases could be readily utilized in combustion engines, a rapid advance followed. The highest thermal efficiency yet at hand in such engines is thirty-eight per cent, which was secured in a two-cycle type of engine; but it remains to be seen whether this type of engine will be satisfactory for small motors. It is possible that the greater complication of details in the two-cycle types, as compared with the simpler four-cycle engine, will cause the latter to continue to give the greater satisfaction, at least for smaller sizes. It is not to be understood that the gas engine will displace either the electric motor or the steam engine. Each has its legitimate sphere of usefulness, but each would be more highly developed as the result of direct competition. Yet the economies already at hand indicate that the field of the gas engine will be extended more and more. The reciprocating steam engine has reached a high state of development, but it is not probable that it has attained its highest degree of perfection. While an economy of less than nine and one-half pounds of steam per horse-power-hour has been obtained, even better results may be expected. But, in any case, and especially with intermittent or variable loads, it is not so much a question of maximum efficiency as it is economy of operation. From this point of view the present activity in the development of the steam turbine is of interest, for with this motor the steam consumption per horse-power varies little from one-third to full load, a feature which predestines the steam turbine to the special field of electric lighting and power generation, where it must inevitably become a formidable rival of the larger-sized, slow-speed reciprocating steam engines. As suggested by Stott, the most economical and reliable plant for large installations is a combination of steam turbines and gas engines. It is doubtful whether such a combination will enable the cost of power to be cut in half as was stated by Stott, but, certainly, marked economies would result from such a combination.—*Abstracted from the* 1906 *Year Book of the Engineers' Society of the University of Minnesota.*

Methods of Getting New Business.

A department devoted to the commercial development of Central Stations. Managers are invited to contribute suggestions for methods of increasing the demand for electric service.

ORGANIZATION AND CONDUCT OF A NEW BUSINESS DEPARTMENT SUITABLE FOR CENTRAL STATIONS IN CITIES OF 50,000 POPULATION AND UNDER.

BY M. S. SEELMAN, JR.[1]

I have been recently in a number of cities, not alone of 50,000 and under, but of 100,000 and over, where the central station had not only no organization for securing new and retaining old business, but no sense or appreciation of the lack of it. These companies do no advertising, make no attempt to educate their public to a knowledge of the superior advantages of an electrical service, have no special propositions, employ no canvassers. Some of them do not even follow up the permits for new buildings. They give no suggestion to the customer as to the most economical and effective methods of lighting his home or store or factory—that is left to the wiring contractor, who in all likelihood has an exceedingly primitive and limited idea of illuminative engineering. The attitude of such a central station may be thus expressed: "Here we are. If you really want to buy current from us and are careful in arranging necessary preliminaries and formalities, we will agree to supply it to you." In one city of about 50,000 inhabitants, not one hundred miles from New York, the customer, before being permitted to do business with the central station, must come to the company's office and sign his (or her) name in a big book kept for that purpose.

The business that comes to these central stations drifts in. If the station makes money it is rather in spite of itself than because of itself. And, under the circumstances, sooner or later the municipal ownership propaganda is certain to take strong hold. There is need of stirring and enlightenment. These stations must "awake, gird up their loins and go forth to do battle" for business.

If I were to be asked what the company, awaking from its lethargy and desirous of securing the possible business within its sphere of operation, should first do toward establishing an effective organization, I would say:

Hire a good man; if possible, one familiar with the kind of work he will be called upon to do; a man under forty, if you can; better yet, under thirty-five. If you can secure one with a combination of technical and commercial knowledge, not necessarily an engineer, but a man who has been trained around a central station, knows something about generating and distributing methods and has tackled lighting and power problems before, so much the better. He will have the less to learn and you the less to teach. But, above all, he must have "ginger," he must be a hustler with red blood in his veins, and in his heart the zest for labor and the pride and loyalty of the service. If the time comes when expert or technical knowledge which he lacks is needed, you can buy that for him, but you can not buy the energy, the dash and the vim if it is not there.

There are many such men to be had. Sometimes we find the very man in charge of some smaller central station. A good place to look for him also is among the employés of the larger companies, where the live young man is likely to have had a more comprehensive experience than would have been possible in a smaller station, and still, because of peculiar conditions, to be working for a wage which would make an offer well within your limit personally flattering and financially attractive.

This man should have charge of the organizing and conducting of our new department. Let us consider him as having been installed and call him the general agent.

The first step our general agent shall take is to establish a first-class and highly attractive office and showroom. This should be located on the main street or principal "square" of the town. If the company's offices are already so located he can alter and utilize them—or a portion of them—for the purpose. But if, as is too often the case, the offices are on some side street at a distance from the business centre, or even—as frequently happens—in the generating station itself somewhere on the outskirts of the city, then the general agent must either get the company to move its entire offices, bag and baggage, to a main location or else hire for his department alone a suitable store. I should recommend the former course, so that every time a customer comes in to pay his bill, or anybody enters the office for any purpose, he must necessarily see the exhibit of electrical appliances and utensils. Thus the law of suggestion comes into play and the visitor becomes more or less interested in those things to which we desire to attract his attention.

This new office and showroom must be made bright and attractive. The color scheme should be a creamy white that will reflect the light to the best advantage. The electrical exhibits ought to be as varied and complete as possible. A great many exhibits can be secured at little cost from manufacturers, who will be glad to cooperate with the central station for the advantageous display of their wares.

The windows of this office must be utilized to illustrate different methods of show-window lighting. Arranged on separate switches can be shown exhibits of trough incandescent lighting (as by Frink reflectors), incandescents in combination with cone or holophane reflectors, and Nernst lamps with the special Nernst reflectors. The common method of window lighting by means of projecting incandescents running around the sides of the windows, or by chandeliers, may also be shown, but in this case care must be taken to explain to customers that wherever the object of the lighting is to display the goods, then one of the three first-mentioned systems of reflected light from hidden sources is the more desirable, while the visible lamps, projecting or in chandeliers, may only be used to advantage when the object is not so much to draw attention to the goods as to attract the eye to the window itself, as with a saloon.

In the show window itself should be placed an exhibit of electric fans and heating appliances, such as irons, water

[1] Winner of the $500 prize given by the Cooperative Electrical Development Association, Cleveland, Ohio.

and food heaters, coffee percolators, chafing dishes, stoves, toasters and grids, heating pads, curling irons and the like. Adjacent to each appliance place a neatly printed or painted card, naming the article and a definite price for its use, thus:

THIS ELECTRIC IRON
Can be used for one hour
FOR SIX CENTS

If there is room in the window, a sewing machine operated by a motor should be prominently featured and kept running, as a moving object attracts more attention than a still-life exhibit. If you prefer, a buzz saw or a coffee mill might be thus utilized instead of the sewing machine. Two or three handsome reading lamps will add a touch of art and color to the window.

An exhibit of various types of lamps should be installed in the office. These should include arc lamps (one showing the concentric diffuser), one, two and three-glower Nernst lamps (there is a simple but highly artistic five-single-glower Nernst lamp fixture which could well be made a part of this exhibit), Meridian and high-efficiency lamps, Cooper Hewitt tubes, turn-down lamps—such as the Hylo—and attractive and efficient clusters, such as the "Arc-Burst" and the "Pagoda" reflecting arc. Holophane glassware could be shown as an annex to this exhibit.

Two or three types of panel signs, individual letter signs and transparencies should be installed in this showroom if there is space for them; novelties in signs and transparencies could be added from time to time.

The balance of the exhibit should be made as complete and interesting as is possible within a reasonable expense limit. There must be a motor exhibit, of course, and among other appliances that could be given a place in the showroom might be mentioned these:

Electric pump, electric organ-blower, electric forge, electric drills and lathes, electric coffee mill, combination electric meat chopper and coffee mill, electric dough mixer, electric ice-cream freezer, electric vibrators, electric dental machinery, prepayment meters, theatre dimmers, electric vacuum carpet cleaner, motor operating refrigerating machine, motor operating adding machine, the Gray telautograph.

In a prominent place over the desks which his canvassers are to occupy our general agent should have a sign hung, reading:

DON'T TALK VOLTS AND AMPERES TALK DOLLARS AND CENTS

And this brings us to the subject of canvassers. The general agent will, of course, take steps at once toward securing the aides required in his campaign for new business, the principal questions that arise being: how many does he need; in what manner shall he secure them and how much ought he to pay them?

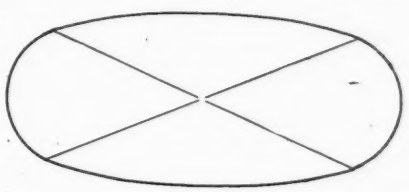
The solution of the first question must be governed to a considerable extent by local conditions—the industrial, commercial and residential nature and status of the town. Roughly speaking, I should say that—other things being equal—a city with 50,000 population or less, which is alive and fairly prosperous, would require one canvasser to about every 12,500 population. This is an elastic rule, however, and must be freely interpreted. For instance, I have in mind a factory town in New England with a population of 100,000, of which 35,000 are mill hands, comparatively few of which would be "prospects." In deciding upon the number of canvassers needed there, that 35,000 would receive but scant consideration. Take it then that we start with one canvasser for every 12,500 population, and these we can lop off or add to as future conditions and contingencies may show to be necessary.

To secure the men we want, we must either again draught from the larger companies or advertise in technical publications. Very likely our general agent knows one or two men of the type he wants who are working for other companies and whose services he can secure. It may be possible to take an employé from some other department of the business and put him to canvassing, but my experience has been that such men are rarely effective and usually unsatisfactory. As a rule, if I had to, I would rather take salesmen from some other line of business and educate them.

As to remuneration, whether straight salary or salary and commission is the best method of paying is a debatable question. I am a firm believer in the latter method as the one most effective for securing new business. Especially is this true in residence districts, where the householder must frequently be interviewed at night, the only time he is to be found at home. The canvasser on straight salary naturally hesitates to give up many of his evenings to this work, but if each call may mean a dollar or two to him, it becomes a different proposition. An equitable arrangement for the payment of canvassers would be, I should say, about $12 per week salary and a commission of two cents per sixteen-candle-power-lamp equivalent for all over 250 equivalents a month the canvasser turns in. In addition the company should pay his carfares and incidentals.

Now then, let us suppose we have gathered our selling force together and have equipped our showroom. We are still not quite ready for business. It is advantageous, I believe, to give the new men the run of the office for a day or two, so that they may become acquainted with the company's physical layout and its installation, metering and service methods. During this time our general agent can have divided the city into districts, one for each of his canvassers. A word about this work of districting.

There are many cities where the business district is largely concentrated in the centre of the town. In places of this kind I believe it an excellent plan—at least to start with—to district along lines starting at a common centre in the business section and radiating outward, thus:



In this way you give each man a portion of business section, of residence locality and probably of power territory. Later on you may find that one of your men is especially effective in residence work, another for business or for power propositions, and it is then easy to redistrict in accordance with the special qualifications of your men. Or, again, later on—to vary the system—occasionally one man may be given one line of business—the printers or the butchers or bakers, or whatever line may be selected—to canvass right straight through, giving a report upon each one interviewed.

Now then, we are pretty nearly ready to canvass. Our general agent gives his men a selling talk—not only to inspire them with enthusiasm, but to give them the last word of information as to how to approach and handle various light and power propositions as they may present themselves, so that the men may be com-

petent to advise prospective customers as to matters involved in their installation, such as wiring, selection of lamps and glassware, location of switches and outlets, painting and decorating of houses and stores to produce the best and most economical lighting effects, types of motors in general most suited for special classes of power work, ideas and methods of apportioning the units in a power installation, etc. It is well if these instructions, together with the special propositions offered by the company, be gotten up compactly in small book or pamphlet form and handed to each canvasser. Of course the canvasser must be told to refer at once all propositions that he finds himself unable to adequately or competently handle to the general agent. If he starts such business he is entitled to his commission thereupon, even if the deal has to be consummated by the general agent or some expert or specialist. In connection with this talk of the general agent to his men, it may be said in passing that it is excellent business to secure from time to time and as frequently as possible experts in various lines to address the members of your business department—illuminating engineers, power men, Nernst, meridian and high-efficiency representatives, heating appliance manufacturers and the like. This helps a great deal.

Now to canvass. Some might advise a preliminary canvass to secure names and addresses of prospects, but I believe in digging right in from the start, reaching out after business from the first day. The district agent begins work about 9 A. M. and is instructed to report back about 4.30 or 5 P. M. If this is not practicable on account of distances, then reports can be limited to the morning session, the district agent arriving at the office at eight instead of nine o'clock; but where practicable it is better to have the agent return late in the afternoon so that he may report on his day's business then, giving time for the general agent to go over the reports and prepare his instructions to his men for issue in the morning.

There are a number of systems of keeping track and record of canvassers' work. The card system is probably the best for the city of 50,000 or less. The district agent's daily report of his work he makes out in the form of a card for every one visited, on which card is inscribed name, address, nature of business, date visited, attitude of the visitee, prospects of doing business with him, when to call again, etc. This is not a particularly arduous job for the canvasser, as he is not likely to call upon more than from twelve to twenty people a day.

The general agent must look these daily card reports over carefully before they are alphabetically filed away. He must especially note any difficulties or obstacles encountered by his men, and he himself must bend his best sales efforts on these especially difficult problems and propositions. If a canvasser reports a man as positively out of the prospective class, before the general agent accepts this classification he should either send someone else to see the recalcitrant or go himself. In this way the impossibles can be eliminated and the card catalogue list becomes a list of prospectives.

And this list of "prospects" soon assumes proportions and furnishes the very best possible list for the effective distribution of printed matter.

And this brings us to the important subject of advertising.

I am inclined to believe that newspaper advertising is likely to be more advantageous and profitable in a small city than it is in a big one. There should be more or less of it done in every city, not only because it promotes a desirable feeling of good will between the newspapers and the corporation, but because it certainly has a very real educative value. In the average big city, however, the character of the population is such that out of a circulation of, say, 100,000 that some newspaper may have, only one or two thousand may be possible customers. In advertising the company must pay to reach the 98,000 unprofitable ones along with the 2,000 prospects, and it is, as a general proposition, uneconomical to pay for all this surplus publicity. In the average small city conditions are different. Circulations are not so large nor mediums so numerous, advertising charges are not so heavy and a larger proportion of readers are likely to be prospects. So that, for advertising in the city of 50,000 or less, I would utilize the newspapers to a considerable extent. Take a whole page or a half-page once in a while on some special occasion, such for instance as a reduction in rates or the inauguration of some new policy or special proposition, or a marked addition to station capacity. At other times use an advertisement each week in dailies, not all the year round, but for certain months in the year, pausing now and then to take breath and gather renewed energy for a new campaign. The size of these advertisements should not be fixed hard and fast, but should vary up from a minimum of five inches single column or four inches double, according to the particular message it is desired to convey.

I doubt if a central station in a city of 50,000 or less would support a first-class advertising man, and the other kind is of little use—liable to cost a good deal more than his salary. If your general agent can write a good advertisement—and a good advertisement does not need to be "smart" at all; it is merely the embodiment of a common-sense argument or a special proposition in an attractive form—so much the better. He can do that part of the work to advantage, especially if it is some special proposition or announcement of local interest and value that is being made. For general advertising of educative effect some of the advertising agencies that have made a specialty of electrical work—notably the Curtis Advertising Company, of Detroit, and the C. W. Lee Company, of Newark—get up clever and attractive newspaper advertisements, both text and illustration, and supply them at a price that any central office can afford. Or the general agent can secure samples of the advertisements of the larger companies by writing for them, and many of these can be readily adapted for local use.

The same rule or methods may follow in securing advertising matter for the other and, in my judgment, more valuable system of advertising by letters, circulars, booklets, etc., distributed through the mail. The advertising agencies get up some very excellent and relatively inexpensive general educative matter which is printed with your name and—as far as any one who receives it knows—emanates originally from you. In this category is the "residence number" of the electrical bulletin recently issued by the Curtis company. Letters, circulars, etc., that refer to purely local offers; conditions and announcements must, of course, be gotten up in the home office by the general agent or an assistant, and here again samples of the big companies' advertisements will be of aid, if not to pattern after, at least to suggest ideas and methods of treatment. Another big help is to get a good printer, even if he costs you more. Don't have a poor printer if you can avoid it at any price. The good one is often able to aid you with ideas, suggestions and plans for the effective construction of advertising matter.

(To be concluded.)

INDUSTRIAL SECTION.

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS.

Small Riveted Frame Induction Motors.

The General Electric Company is placing on the market a new line of low-powered polyphase induction motors in capacities up to seven and one-half horsepower, which embody several new and interesting features of construction. Some time ago this company began the construction of a skeleton frame type of induction motor in the larger sizes and the success with which these machines have operated has led to the building of the smaller sizes on the same principle. In the older designs of motors it has been customary to build such machines with a solid magnet frame. The new design has proved its superiority, however, and without sacrificing rigidity or strength, much unnecessary material has been eliminated,

TOTALLY ENCLOSED, SIX-AND-ONE-HALF-HORSE-POWER, 110-VOLT, RIVETED-TYPE FRAME INDUCTION MOTOR.

decreasing the weight of the machine and increasing the ventilation and general efficiency.

In the new motors, low temperatures, light weight of active material per horsepower and compactness and rigidity have been embodied by constructing the stator as shown in the illustrations. The cast-iron hoods common in most motors over the stator laminations, are omitted, and the stator punchings are assembled, clamped between cast-iron rings or flanges and permanently secured by bolts riveted at the ends. In the enclosed type, the same principle is followed but additional steel flanges of a larger diameter are heaved into the stator laminations, increasing the radiating surface and thus offsetting to a large degree the smaller amount of ventilation existent with the closed end shields. The resulting stator, while novel in appearance, is very efficient and the reduction in output with the enclosed type of motor is greatly minimized.

Aside from the decreased weight per horse-power, and the compactness and rigidity, the ventilation in the new design is greatly improved due to the direct

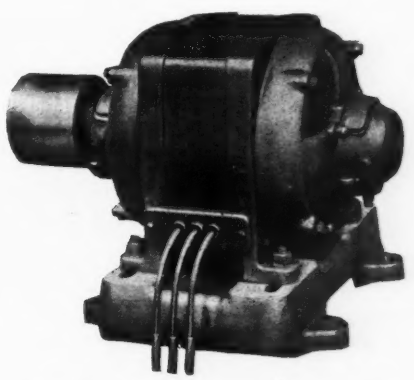
FOUR-HORSE-POWER, 220-VOLT, RIVETED-TYPE FRAME INDUCTION MOTOR.

contact of the laminations with the air, thereby increasing the heat radiation and insuring low operating temperatures at considerable overloads.

The rotor used in both open and enclosed motors is of the squirrel cage, short-circuited type, having no rubbing contacts. This simple and durable revolving element lends itself admirably to motors of small powers since there are no wearing parts and the cost of repairs and operation is practically negligible. Furthermore, these motors can be run in exposed and dusty locations without injury, and the absence of brushes or commutator makes this form of motor absolutely safe in powder, flour or chemical works where elaborate precautions must be exercised against fire.

The qualifications of compactness and good efficiency of the electrical design which adapt these motors to all classes of small power purposes are extended by several mechanical features which make the motor very easy to install. The motors may be used with or without a sub-base and mounted on floor, wall or ceiling, without additional fixtures. By turning the bearing brackets or end shields through ninety or one hundred and eighty degrees relatively to the frame, the bearings are swung into their proper position for any location. When the motors are belted it is desirable to use a sub-base, and such a one is provided with adjusting gear and screw for belt tightening. The same base is used for any position of the motor, and provision is made for distributing the weight evenly on the base in all positions. Another mechanical detail which has received careful attention is the lubrication of the bearings. Large oil wells are cast in the bearing brackets, and provided with oil gauges and drain cocks. Copious lubrication is provided by oil rings.

In operating these motors the starting torque is greater than is usually met with in squirrel-cage type of induction motor, and the starting current is comparatively small. It is generally advisable, however,



FOUR-HORSE-POWER, RIVETED-TYPE FRAME INDUCTION MOTOR.

to reduce the starting current in the seven and one-half horse-power motors and the General Electric Company makes a compensator of a simple and durable design suited for this purpose. The motors may, however, be started by connecting the stator in Y and changing the delta when the motor reaches normal speed. This change is easily made by a six terminal lead board and a double throw switch. While equivalent to using a sixty-per-cent tap compensator and considerably cheaper, this method of starting is less flexible since only one starting voltage can be obtained.

The standard motors described in the foregoing are made for both moderate and slow speed, the former being generally provided with pulleys for a belt drive, though with a slight modification they are also suitable for direct connection or for gearing.

The light weight per horse-power due

to the riveted form of construction, adapts the motor to many special applications where a heavier, bulkier machine could not be used. The General Electric Company also makes special forms of this new type motor, as shown in the illustrations; a vertical motor for direct connection to a pump and a motor with fan blade mounting.

All motors are manufactured for standard commercial voltages and frequencies for two or three-phase alternating-current circuits and are guaranteed to carry their load continuously, with a temperature rise above the surrounding air not exceeding forty degrees centigrade, and a twenty-five-per-cent overload for two hours with a temperature rise not exceeding fifty-five degrees centigrade.

Central Station Advertising at the National Electric Light Association Convention.

The accompanying illustration gives a fairly good idea of the central station advertising display made by the Curtis Advertising Company, Detroit, Mich., at the exhibition on Young's Pier, in connection with the twenty-ninth convention of the National Electric Light Association, at Atlantic City, N. J., June 5 to 8. This exhibit included posters, postal cards, folders, bulletins, magazines and follow-up systems,

An Exhibit of Central Station Advertising Matter at the National Electric Light Association Convention, Atlantic City, N. J., June 5-8.

all of which are applicable to syndicated central station advertising. The exhibit attracted a great deal of attention, and the company announces that the central station men showed a keen interest in this subject.

The Exhibit Plant of the Automatic Refrigerating Company.

One of the most interesting booths at the recent exhibition held in conjunction with the convention of the National Electric Light Association at Atlantic City, N. J., was that of the Automatic Refrigerating Company, Hartford, Ct. During the four days of the convention this company, represented by three refrigerating engineers, demonstrated to the public the practicability of thermostatically controlled automatic refrigerating apparatus. The exhibition plant, which had not previously been assembled in its entirety, was one of the company's standard one-horse-power motor-operated systems, connected to a small insulated cooler. The appearance of the whole system, which was put in practical operation within two days after its arrival at Atlantic City, inspired considerable confidence in its mechanical characteristics, and its perfect automatic operation proved its efficiency for the work for which it was designed.

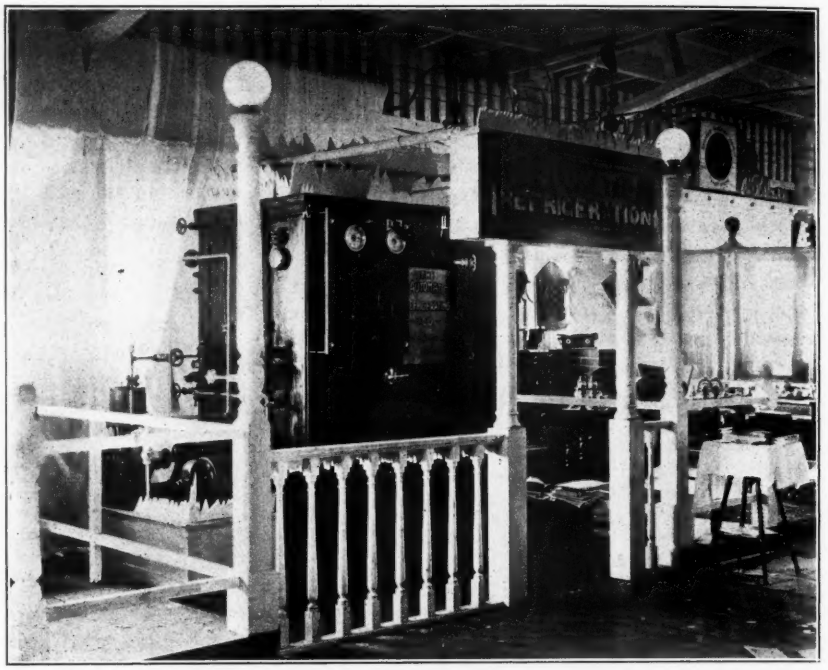


Exhibit of the Automatic Refrigerating Company at the Convention of the National Electric Light Association, Atlantic City, N. J., June 5-8.

The accompanying illustrations indicate the arrangement of the various elements of the system, and give a good idea of the appearance of the exhibit as arranged at Atlantic City. The frost on the lettering surrounding the exhibit was maintained by the direct expansion of ammonia in a small coil of pipe behind the letters. The small cold-storage box, which was also cooled by direct expansion, was provided with a glass door, through which the frosted pipe, as well as the controlling thermostat, could be seen from the outside. This box was maintained at a temperature of from forty to forty-two degrees Fahrenheit, the control of the temperature being effected by a special thermostat designed by the company for cold-storage use. This thermostat carries a small current of electricity necessary to

operate the motor-starting device on the switchboard.

Several of the features of this system attracted a good deal of practical attention, particularly the construction and operation of the automatic expansion valve, the automatic water-regulating valve, and the high-pressure safety cutoff.

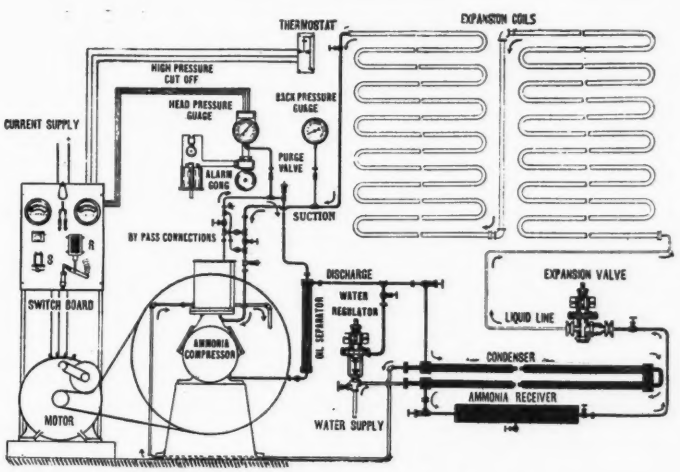
The automatic expansion valve is a special patented form of pressure-reducing valve of such design that the slightest change of pressure within the expansion coils instantly effects an increase or a decrease in the amount of anhydrous ammonia allowed to pass the valve and expand into the cells in the cold-storage compartments. This increase or decrease in pressure, as the case may be, quickly restores the back pressure to the point for which the valve has been set. This, it is claimed, allows the highest possible back pressure, consistent with the lowest temperature required, to be maintained at all times and consequently causes the compressor to operate under the conditions most conducive to maximum efficiency.

These automatic valves are protected against the possibility of stoppage from scale or dirt by an extremely fine steel gauze strainer inserted in the liquid line ahead of the valve. It is claimed by the manufacturers that these valves having once been adjusted need not be touched for an indefinite period. For the sake of a slight increase in economy, however, it is recommended that on account of the difference between the conditions of load in the summer and winter, the expansion valve in the ordinary plant be adjusted twice a year, once in the spring and once in the fall.

A second valve, similar in construction to the automatic ammonia expansion valve, throttles the flow of condenser cooling water to the actual requirements and shuts off the supply entirely when the head pressure drops after the compressor has been stopped. It will be noted that the ammonia expansion valve is regulated by the back pressure, the feed through same being reduced as the back pressure is increased, while the water-regulating valve is regulated by the head pressure, the feed through it being increased as the head pressure is increased.

The question that naturally arises in this connection is what would happen if the water supply should fail so that the automatic water-regulating valve would be unable to supply the required amount to the condenser.

This emergency has not been overlooked, for just above the head-pressure gauge is arranged a small automatic switch which the company calls a "high-pressure safety cutoff." The function of this switch is to shut down the compressor in case the condenser pressure should become abnormal, and to start it again as soon as the pressure should again be restored to normal. Mechanically this is effected in much the same way as the starting and stopping is controlled by the thermostat, the pressure instead of the temperature operating the motor-starting apparatus.



COMPLETE AUTOMATIC REFRIGERATING SYSTEM.

Referring to the diagram herewith the modus operandi is as follows: starting with the "expansion coils" where the liquid ammonia is evaporated and in consequence produces a cooling effect on the surrounding atmosphere, the vapor passes to the "compressor," which discharges it into the "condenser," from which it flows, in the liquid form, to the "ammonia receiver." Between the compressor and the condenser the high-pressure gas is passed through an "oil separator" which separates out any entraned oil picked up in its passsage through the compressor. From the "ammonia receiver," which forms a reservoir, the liquid ammonia passes to the "automatic expansion valve," the function of which has already been explained, after which the above cycle is again traversed.

The circuit of the cooling water is first through the "automatic water-regulating valve," the "condenser" and the "compressor jacket," after which it passes to the sewer, or if of value to a storage tank.

The principal advantages claimed for the "automatic system" are superior efficiency because of the automatic parts, which also places mechanical refrigeration within reach of the man whose small ice consumption will not warrant the expense of engineers, the saving of whose services, by the use of automatic devices, the Automatic Refrigerating Company claims to have demonstrated to be eminently practical.

The Automatic Refrigerating Company's exhibit was in charge of F. E. Matthews, manager, assisted by its Boston representative, Eugene Carpenter, and Expert Engineer A. Michael.

Railway Equipment for the United Railroads of San Francisco.

For the equipment of its new rolling stock, made necessary by the recent fire, the United Railroads of San Francisco has placed large orders with the General Electric Company for various types of railway motors. These include twenty-five four-motor, GE-80 (40-horse-power) equipments; fifteen four-motor, GE-90 (50-horse-power) equipments, and ten four-motor, GE-73 (75-horse-power) equipments. All these equipments will be supplied with the flexible Sprague-General Electric system of multiple-unit control. The GE-80 (40-horse-power) motor is being widely adopted in railway work, many other companies having adopted this motor. It is the most suitable size for city work, and the special M.C.B. oil bearing design has proven extremely popular. The United Traction Company, of Albany, N. Y., has recently ordered twenty-five four-motor equipments of this type and the Philadelphia Rapid Transit Company, 100 four-motor equipments. In several instances, the GE-80 is being substituted on cars already using a less efficient motor. Thirty-six equipments of four motors each were recently ordered by the St. Louis Railway Company, supplanting motors of another type.

CURRENT ELECTRICAL NEWS

DOMESTIC AND EXPORT.

DIRECT CABLE LINE TO JAPAN—Greetings have been exchanged between President Roosevelt and the Emperor of Japan, over the American cable connecting the island of Guam and Japan, which was recently completed. President Roosevelt's message, expressing the good will of the American people and himself, was sent on June 25. The Japanese emperor's reply reached Washington on June 26.

NEW YORKERS TO DEVELOP MAINE WATER POWERS—Arthur E. Leach, a New York banker, has purchased for a New York syndicate a majority of the stock of the Consolidated Electric Light Company of Maine, and has also secured from George A. Fernald & Company, Boston brokers, owners of a controlling interest in the Portland Electric Light Company, an option on that company. The deal involves $1,000,000 and contemplates development of water power on the Saco and Penobscot rivers, whereby electric light and power may be furnished to many cities and towns in western Maine.

THE HOME TELEPHONE COMPANY OF RHODE ISLAND—A company known as the Home Telephone Company of Rhode Island is seeking to obtain a franchise to do a telephone business in Providence, R. I. The company was incorporated several years ago and has obtained franchises for several of the smaller places in Rhode Island, but, up to the present time, has gone no further. It is capitalized at $2,500,000, and has an authorized issue of bonds of $1,500,000. The company undertakes, if it obtains a franchise, to give a free service to its subscribers until 5,000 stations are in operation.

ALLIS-CHALMERS COMPANY BOND ISSUE—A special meeting of the stockholders of the Allis-Chalmers Company has been called, to be held at 15 Exchange place, Jersey City, N. J., on Monday, July 16, to take action upon two resolutions adopted by the board of directors at a meeting held on June 25. One resolution authorized the issue of bonds for an aggregate sum not exceeding $15,000,000, to be secured by mortgage, lien or pledge upon the real estate and manufacturing plants of the company. The other resolution authorized and approved a conditional contract between the company and Messrs. Shearson, Hammill & Company, acting on behalf of a syndicate, for the acquisition of as much of $12,000,000 worth of the bonds as may not be taken by the stockholders.

THE STONE & WEBSTER ENGINEERING CORPORATION—It is announced that an engineering and constructing company with a paid-in cash capital of $250,000 has been organized by Stone & Webster, Boston, Mass., under Massachusetts laws, to take over the engineering part of its business, the firm of Stone & Webster devoting itself to financial affairs and the management and development of the numerous properties which it operates. The new company proposes to undertake engineering and construction work in connection with electric railway, lighting, gas and water-power undertakings, electrification of steam roads, etc., throughout the country. All the stock of the company has been taken by Stone and Webster and their associates. The officers of the corporation are: president, Russell Robb; vice-president and general manager, Dwight P. Robinson; treasurer, Howard L. Rogers.

MEMPHIS STOCKHOLDERS OBJECT TO MERGER—At a meeting, held in Louisville, Ky., of the owners of stock, preferred and common, in the Memphis Street Railway Company, the secretary of the meeting was instructed to address a protest to Isidor Newman & Son against the reported plan of the firm to form a holding company to control the Memphis Street Railway, the Little Rock Railway and Light Company, the Knoxville Railway and Light Company, the Birmingham Railway, Light and Power Company, the Nashville Railway and Light Company and the Houston Lighting and Power Company. The protest says: "We have purchased the securities of the Memphis Street Railway upon our faith of the future growth and prosperity of that city, and do not care to have it linked with other properties concerning which we know little and in which we have no interest. We sincerely trust that you will leave the Memphis property out of your proposed plans."

NORTHERN OHIO TRACTION—The Northern Ohio Traction and Light Company, according to advices from Cleveland, will soon take over the Canton-Akron system. The former's stock will be increased for the purpose and the latter's bonds will be guaranteed, its preferred stock being retired and its common exchanged for that of the Northern Ohio. When the transaction is completed the Northern Ohio Traction's capital stock will be $10,000,000, its outstanding bonds, $900,000, and its earnings this year about $1,700,000. The Northern Ohio Traction owns the interurban line from Cleveland to Akron and Barberton and the city lines and lighting plants of Akron and Barberton, with a line to Kent and Ravenna. The Canton-Akron system includes the line from Canton to Akron, with the city lines of Canton and Massillon and the new interurban line from Canton to New Philadelphia and the Tuscarawas Traction Company, altogether about eighty-seven miles. The Canton-Akron has outstanding $2,000,000 bonds and about $1,800,000 stock. This will give a through route, Cleveland to Canton.

ANOTHER EXTENSIVE TRACTION MERGER—The incorporation of the Indiana, Columbus & Eastern Traction Company recently, with a capitalization of $12,000,000, marks the beginning of one of the largest electric traction consolidations which has yet taken place in the West. The company is one of the Widener-Elkins creations and will take over all the traction lines in Ohio which have been held by the Ohio syndicate of which W. Kelsey Schoepf, of Cincinnati, is chairman, and J. H. McGowan, of Indianapolis, chairman of the Indiana syndicate, is vice-chairman. The Indiana, Columbus & Eastern will take over the Columbus, London & Springfield, operating between Columbus and Dayton; the Columbus, Grove City & Southwestern, operating between Columbus and Morgan's Station; the Dayton, Springfield & Urbana, operating between Dayton and Urbana; the Dayton & Western, operating between Dayton, Ohio, and Richmond, Ind.; that part of the Dayton & Muncie operating between Greenville, Ohio, and Union City, Ind.; the Dayton & Northern and the Columbus & Lake Michigan from Defiance to Lima. It will also build a new line from Bellefontaine to Lima to connect with the Lima & Toledo, now under construction, and will lease the lines of the Columbus, Newark & Zanesville Traction Company, operating between Columbus and Zanesville. The capital stock of the latter company has been increased to $6,500,000, and it has bought the Columbus, Buckeye Lake & Newark and the Zanesville city lines. The consolidated company will operate more electric mileage than any other single corporation in the country, having under its immediate control over 500 miles of interurban lines. It will cover all of central and western Ohio and by connection with the lines of the Indiana syndicate will be enabled to operate through cars from Zanesville to Terre Haute, Ind., a distance of over 300 miles. The principal cities which it will connect are Cincinnati, Toledo, Cleveland, Columbus, Indianapolis, Muncie, Ind.; Zanesville, Ohio; Dayton, Ohio, and Newark, Ohio. The Columbus, Newark & Zanesville will issue $5,000,000 of bonds to care for underlying issues and to provide for improvements and extensions, and the Indiana, Columbus & Eastern will have an authorized bond issue of $12,000,000, of which, however, but a part will be now issued. All of the roads will be put in the best possible shape and high-speed passenger and express cars will be run. The company expects to compete with the steam roads in all kinds of traffic, and already has secured sites in Dayton and Columbus for large interurban passenger and freight union stations. The station to be built in Columbus will cost in the neighborhood of $1,000,000.

PERSONAL MENTION.

MR. EDWARD M. TAYLOR, who has been in charge of the traffic department of the Lynchburg (Va.) exchange of the Southern Bell Telephone Company, has been appointed manager of the Lynchburg district, in place of D. F. Turnbull, who has been promoted to a position at Birmingham, Ala.

PROFESSOR GEORGE I. ROCKWOOD has been appointed to the professorship of steam engineering in the Worcester Polytechnic Institute, Worcester, Mass. Professor Rockwood is a graduate of the Worcester Polytechnic Institute, class of 1888, and is one of the leading authorities in this country on the subject of steam engineering.

MR. LOUIS STUART THURSTON, who has been identified with the Cincinnati office of the General Electric Company, was married on June 26 to Miss Annie Louise Smith, of Delaware, Ohio. Mr. Thurston is a New York man and a graduate of the engineering department of Columbia College, and he has been active in electrical engineering in the middle West during the last few years.

MR. WALTER CLARKE DEAN has opened offices in the Bank of Commerce Building, Norfolk, Va., and will represent the C & C Electric Company. Mr. Dean is a graduate of the Massachusetts Institute of Technology, and has had considerable experience in the equipment of the Norfolk Navy Yard, where he has made a specialty of variable-speed motors for driving machine tools.

NEW PUBLICATIONS.

PROCEEDINGS OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION—The book of proceedings of the Atlantic City convention of the National Electric Light Association will probably be distributed about the first of November. For those who wish to receive at once the papers read at the meeting, a number of sets are available at a price barely sufficient to cover the cost of printing and distribution, namely, $1.25 for the papers and $1.25 for the question box.

THE TRUE RAILROAD SITUATION IN MASSACHUSETTS AND THE INTERURBAN ELECTRIC RAILROAD—Mr. John H. Bickford has published, in pamphlet form, the information which was presented by him and others to the Massachusetts railroad and street railway committees. The subject is taken up under several headings, including a discussion of the state policy with respect to railroads, the relation of present classes of carriers to each other and to the public, the physical limitations of each class and their inability to meet the growing demands of the public for better facilities, and the electric railroad on private right of way. The whole forms an interesting study of the present situation in Massachusetts.

DIRECTORY OF DIRECTORS IN THE CITY OF NEW YORK—The 1906 edition of the "Directory of Directors in the City of New York," published by the Audit Company, of New York, 43 Cedar street, New York city, is ready for distribution. This book is of great value as a reference, and bears the unmistakable stamp of accuracy and authenticity. The first part contains a complete alphabetical list of directors and trustees having New York city addresses, followed by the names of the companies with which each is connected. The name of the firm or company with which each director is most closely associated is given in all cases where facts were obtainable, on the same line with the name and address. The second part of the book—the appendix—contains selected lists of corporations in banking, insurance, transportation, manufacturing and other lines of business, alphabetically arranged, accompanied in each case by the names of the company's principal officers and all its directors or trustees. The book forms a comprehensive directory of all the large business interests in New York city, containing practically all the addresses desired by business men. The 1906 edition is printed from new type, is nicely arranged, very easy to read, and is handsomely bound in red cloth covers.

ELECTRICAL SECURITIES.

Liquidation continued in the stock market during the past week, due largely to the uncertainties of the money market, resulting in net declines throughout nearly the entire list. While the call money rate has been nothing unusual for this period of the year, time money has hardened perceptibly, rates for periods carrying over the year advancing to five and three-quarters and six per cent, and, in cases of mixed collateral, to seven per cent. The bank statement, while favorable, was somewhat disappointing, in view of the large dividend and interest disbursements to be made. Another factor has been the recent ruling, to the effect that there shall be a charge of $2 on every 100 shares of stock sold in New York state, regardless of its par value, which has had a tendency to restrict sales of securities having a par value of less than $100, notably in the cases of Reading and Pennsylvania. Crop reports have been generally favorable, one estimate placing the probable wheat crop at a new high record total. The iron and steel industries are also in a prosperous condition.

ELECTRICAL SECURITIES FOR THE WEEK ENDING JUNE 30.

New York:	*Closing.*
Allis-Chalmers common	17¾
Allis-Chalmers preferred	96½
Brooklyn Rapid Transit	75⅛
Consolidated Gas	138⅝
General Electric	161¼
Interborough-Metropolitan common	36¼
Interborough-Metropolitan preferred	74
Kings County Electric	165
Mackay Companies (Postal Telegraph and Cables) common	70
Mackay Companies (Postal Telegraph and Cables) preferred	71
Manhattan Elevated	147
Metropolitan Street Railway (ex dividend)	106
New York & New Jersey Telephone	121
Western Union Telegraph	91¼
Westinghouse Manufacturing Company	152½

The income statement of the Interborough Rapid Transit Company for the year ended March 31, 1906, follows: earnings from operation, $18,954,273; operating expenses, $8,357,084; net earnings, $10,597,189; other income, $748,972; gross income, $11,346,161; interest, rentals, etc., $8,461,978; net income, $2,884,183; dividends (8 per cent on $35,000,000), $2,800,000, leaving a surplus of $84,183 for the year, which added to the previous surplus, $2,012,365, makes the total $2,096,548.

The directors of the New York & New Jersey Telephone Company have declared the regular quarterly dividend of 1½ per cent. The annual rate paid by the company, however, is 7 per cent, because for several years an extra dividend of 1 per cent has been declared in January. The dividend is payable on July 16 to stockholders of record on July 5.

Boston:	*Closing.*
American Telephone and Telegraph	134
Edison Electric Illuminating	241
Massachusetts Electric	68¼
New England Telephone	130
Western Telephone and Telegraph preferred	91
Philadelphia:	*Closing.*
Electric Company of America	11½
Electric Storage Battery common	69
Electric Storage Battery preferred	69
Philadelphia Electric	8
Philadelphia Rapid Transit	24½
United Gas Improvement	81½
Chicago:	*Closing.*
Chicago Telephone	115
Chicago Edison Light	142
Metropolitan Elevated preferred	66
National Carbon common	82
National Carbon preferred	117
Union Traction common	4
Union Traction preferred	14

The postponed annual meeting of the Chicago Edison Company was held on June 26, and the retiring directors were reelected. Nothing was done toward a consolidation of the Edison and Commonwealth companies. The Edison report shows about 9.04 per cent earned on the stock, compared with a little less than 8.6 per cent a year ago. The Commonwealth earned 2.86 per cent on its stock, against 2.83 a year ago. The Chicago Edison has announced to customers a reduction of 11 per cent in rates, commencing July 1.

OBITUARY NOTICES.

DR. JOHN A. TANNER, JR., died at Boston, Mass., June 21. He was for many years a surgeon in the United States navy, but had been in private practice since his retirement in 1887. While in the service he made many electrical investigations on cables and on insulating materials, and also designed electrical apparatus for the government use.

MR. HARRY BOTTOMLEY died at Knutsford, England, on Saturday, June 16. Mr. Bottomley was born in Belfast, Ireland, thirty-two years ago. For the last three years he had been assistant treasurer of the English branch of the Westinghouse Electric and Manufacturing Company. He was a brother of John B. Bottomley, vice-president of the Marconi Wireless Telegraph Company.

MR. CHARLES EASTMAN TRIPLER died on Wednesday, June 20, at Liberty, N. Y., after an illness of several months. Mr. Tripler was born in New York city in 1849, and while attending private schools showed an aptitude for mechanics and chemisty. When he was twenty-three years old he constructed a naphtha condensing engine, and then devoted himself for several years to experimenting with chemicals. In 1890 he discovered a means of liquefying air, and two years later succeeded in producing liquid oxygen and nitrogen at a cost of five cents an ounce. A stock company capitalized at $20,000,000 was formed to put the method into commercial use, and all sorts of claims were made for the product. The company was never a financial success.

MR. LOUIS CASSIER, proprietor of *Cassier's Magazine* and the *Electrical Age*, was killed in the railway accident at Salisbury, England, on Sunday, July 1. Mr. Cassier was born in Boston, Mass., forty-four years ago, and did his first magazine work with the *Musical Courier*, of New York city. Later he was connected with the New York advertising office of the *Illustrated London News*, and in 1891 started *Cassier's Magazine*. A few years ago he bought the *Electrical Age* and reorganized its management, becoming president of the company. He went abroad in 1894 and started *Cassier's Magazine*, of London, and since then has divided his time between New York and London. Mr. Cassier was a member of the Reform, Automobile and Camera clubs, the Municipal Art Society and the American Society of Mechanical Engineers. He is survived by his wife, who was Miss Agnes Nichols, of Trumbull, Ct., where Mr. Cassier had a country home.

MR. CHARLES C. NEWTON, president and treasurer of the Newton Machine Tool Works, Incorporated, Philadelphia, Pa., died at Bremen, Germany, on Wednesday, June 13. Mr. Newton had not been in good health for some time past, and had gone to Europe to seek relief at the baths at Bad, Nauheim, Germany, but was too ill to continue his journey after his arrival at Bremen. Mr. Newton was held in high esteem by all who knew him, owing to his unswerving honesty and integrity, coupled with his exceptional ability as a designer of machine tools. Charles C. Newton was born February 9, 1846, at Cambridge, Washington county, N. Y. At the age of nineteen he indentured himself as an apprentice to the Brooks Locomotive Works, Dunkirk, N. Y. After finishing his apprenticeship and working in various shops, Mr. Newton returned to Dunkirk in 1875 and in partnership with J. D. Cox manufactured twist drills, reamers, cutters, etc., removing to Cleveland, Ohio, in 1876, to broaden the scope of their work, operating under the firm name of Newton & Cox. In 1880 Mr. Newton sold out his interests to Mr. Cox, who formed out of the old firm the Cleveland Twist Drill Company. Going to Philadelphia, Mr. Newton laid the foundation for the present Newton Machine Tool Works, Incorporated, in a little shop on Callowhill street, with only himself and an assistant as the working staff. In the fall of 1886 he built a new shop to accommodate the increased demand for his material, and in August, 1895, the first part of the present shop was erected. Mr. Newton was the sole proprietor of the works until July 14, 1897, when articles of incorporation were taken out, the firm being the Newton Machine Tool Works, Incorporated, with Mr. Newton as president and treasurer. Mr. Newton was a member of the Engineers' Club, American Society of Mechanical Engineers, the Art Club, of Philadelphia, and the Athletic Club, of Philadelphia.

ELECTRIC LIGHTING.

BRONSON, MICH.—The electric light plant which was recently destroyed by fire will be rebuilt at once.

McGRAW, N. Y.—The contract for lighting the streets of McGraw for one year has been let to the Cortland & Homer Electric Company.

MILWAUKEE, WIS.—The village of West Milwaukee has awarded the contract for its street lighting to the Milwaukee Electric Railway and Light Company at $84 per light, to burn all night.

DUQUOIN, ILL.—The Duquoin city council has granted a waterworks and electric light franchise to D. E. Nottley, of Pittsburg, and E. C. Parker, of St. Louis. Work on the installation of the electric light system will begin at once.

LEXINGTON, VA.—Robert E. Hutton, general manager for the Lexington Light and Power Company, has placed orders for the necessary machinery and equipment for the improvement of the plant. The new equipment is expected to arrive by August 1, and will be installed by the early fall.

NIAGARA FALLS, ONTARIO—At the annual meeting of the shareholders of the Canadian Niagara Power Company the following directors were elected: W. H. Beatty, W. H. Brouse and Wallace Nesbitt, of Toronto; De Lancey Rankine, of Niagara Falls, N. Y., and A. Monroe Grier, of Niagara Falls, Ontario.

SLATINGTON, PA.—At the annual meeting of the stockholders of the Citizens' Electric Light, Heating and Power Company the old board of directors was reelected for the ensuing year as follows: Fred Horlacher, E. D. Peters and Charles Benner, Jr., of Slatington, and Robert E. Wright and Hugh E. Crilly, of Allentown.

WILKESBARRE, PA.—There is a movement on foot among the merchants of Wilkesbarre to organize a new light company. Some of the leading merchants and largest consumers of light have subscribed for stock in the new corporation, which will be capitalized at $250,000, and have signed contracts to use the light for a period of five years.

HUNTSVILLE, ALA.—The Muscle Shoals Power and Development Company has been incorporated in Colbert county for the purpose of developing power from Muscle Shoals in the Tennessee river. The incorporators are: S. J. Kernachan, W. J. Kernachan, G. B. Shea and J. R. Coleman. The company will build an electric power-house near the shoals.

TECUMSEH, NEB.—The outcome of the movement started by the Commercial Club for better electric lighting service has been the appointment of a committee by Mayor H. T. Ward to go to Seward and investigate the conditions there, where, as in Tecumseh, municipal ownership prevails. If conditions warrant, the city council will call a special election for the purpose of voting $10,000 for the proposed improvement.

SPOKANE, WASH.—It is said that the Madison River Power Company, at Twin Bridges, Mont., is contemplating the building of another large power plant on the Madison river to furnish more electric power for Butte mines and smelters, the plant now in operation in the Madison cañon being inadequate to the demands for electric power. A party of surveyors is now in the upper Madison valley for the purpose of making surveys.

BURLINGTON, PA.—Ownership by the city of its own lighting system is again agitated, and a special committee appointed by the common council to enquire into the matter has reported in favor of municipal ownership. Council has deferred action on the report until a further investigation is made by the committee to ascertain whether or not the city can legally furnish lights for other than public use. The report of the committee shows that the city is paying yearly for arc lights $90 each and for incandescent lights $21.50.

BELLEVILLE, ILL.—The property of the Belleville Gas and Electric Light Company, in Belleville, has been sold to a syndicate of Chicago capitalists, headed by K. A. Ames, the consideration being $500,000. Harry Kircher will be retained as manager, it is stated, and very few, if any, changes will be made. The company was reorganized about four years ago with Judge R. D. W. Holder, Attorney L. D. Turner and ex-Mayor M. M. Stephens, of East St. Louis, as principal stockholders. They invested about $350,000 at that time.

TELEPHONE AND TELEGRAPH.

RICHMOND, VA.—The Southern Bell Telephone Company will expend $400,000 in improving its service in Richmond.

NEWARK, N. J.—Plans are being prepared for a two-story exchange building at Haddonfield, N. J., for the Delaware & Atlantic Telephone Company.

DUNKIRK, N. Y.—The Bell Telephone Company is to expend $30,000 in improvements in Bradford this summer. A new $10,000 exchange will be built.

AUBURN, N. Y.—The certificate of the increase of the capital stock of the Southern Cayuga Telephone Company from $15,000 to $30,000 has been filed in the county clerk's office.

ALBANY, N. Y.—The Bell Telephone Company has filed with the secretary of state a certificate to the effect that the Wyoming & Cattaraugus Telephone Company has been merged with it.

MALAGA, WASH.—The Columbia River Lumber Company, of Wenatchee, is building a telephone line from Malaga to Laurel hill. Poles are also being cut for a telephone line for the Stemilt valley and Laurel hill.

CHARLOTTE, N. C.—Three new circuits north *via* Greensboro will shortly be run by the construction department of the Southern Bell Telephone and Telegraph Company out of Charlotte. There are in operation now eight circuits.

REDLANDS, CAL.—The Coachella Valley Home Telephone Company is the name of a recently organized company which will have for its object the connecting of towns through Coachella valley, the lines extending from Mecca to Indio. The officers of the company are: president, J. D. Turnbull; vice-president, F. E. Dudley; treasurer, C. C. Abbey; secretary, K. C. Wells.

ANAHEIM, CAL.—The Valley Home Telephone Company will establish a system covering all of northern Orange county, comprising the cities and the districts of Anaheim, Fullerton, Placentia, Buena Park, La Habra, the Fullerton oil fields, Garden Grove, West Anaheim, Brookshurt, Yorba, Benedict, Miraflores and Claire. Arrangements have been made to connect with the Home Telephone Company. About $125,000 will be expended on the system.

BALTIMORE, MD.—The Chesapeake & Potomac Telephone Company opened its new St. Paul exchange on the night of Saturday, June 16. The company has had no St. Paul exchange since the fire in February, 1904, when its central exchange was destroyed. The opening of the new exchange involved the changing of about 16,000 telephone numbers. The new exchange is located on the ninth floor of the Chesapeake & Potomac company's new building on Light street.

SACRAMENTO, CAL.—The Pacific States Telephone Company is to erect a six-story building on the site of its former building at 140 New Montgomery street. The frame is to be of the steel-cage construction and the foundations and floors of reinforced concrete. The inner walls will be of fireproof material and the outside decorations will be of pressed brick, terra cotta and copper. Metal sashes are to be used for the wired-glass windows, which will be rendered doubly fireproof by rolling iron shutters. The whole building will be in Italian renaissance style. The cost is estimated at $300,000, and the time for construction at twelve months.

ALLENTOWN, PA.—The Consolidated Telephone Company has concluded a deal, by which it leases for a term of 999 years the Easton & Bethlehem Telephone Company's lines. This line was started about five years ago. The company later failed and was reorganized by a company, of which W. A. Wilbur is the president, and J. Davis Brodhead, secretary. It takes in all of the Bethlehems, Easton, Phillipsburg, Alpha, Martin's Creek, Freemansburg and surrounding territory, with a total pole mileage of about 500 miles and 1,400 subscribers. The company also purchased outright the Honesdale Telephone Company, which operates a line from Hawley to Carbondale, a distance of thirty-two miles and has about 400 subscribers. The Consolidated also purchased the Berwind Telephone Company, which operates a line from Lime Ridge to Nanticoke, about twenty-five miles, with important long-distance connections and about 500 subscribers. The Consolidated company will immediately commence developing and extending these lines. All of them will be connected with the Allentown exchange thus affording direct communication from that city.

ELECTRIC RAILWAYS.

GOSHEN, IND.—Wakarusa has voted a $7,000 subsidy to the Fort Wayne & South Bend electric line. Nappanee voted $8,000.

SHARON, PA.—Announcement is made that the interurban trolley line between New Castle and Meadville will be built this year.

ASHLAND, KY.—The Ashland Interurban Railway Company has been incorporated to build an electric traction road in Ashland, and extending to Russell, opposite Ironton. Later the road will be extended to Greenup, Ky. The company will also furnish electric current for commercial purposes.

LIMA, OHIO—The Widener-Elkins syndicate has acquired control, by lease, of the Dayton & Western traction line, extending from Dayton to Richmond, Ind. By the arrangement six per cent per annum will be paid on the $850,000 preferred stock and on the $450,000 common stock. This makes an annual rental of $78,000.

BALTIMORE, MD.—The United Railways and Electric Company is having surveys made from Towson to Lutherville with the view of constructing an electric line. This route has been practically mapped out, and in a short time, it is thought, bids for the construction will be invited. The purpose is ultimately to extend to Cockeysville.

INDIANAPOLIS, IND.—The Electrical Installation Company, of Chicago, and the Allis-Chalmers Company, of Milwaukee, which have the entire contract for building and equipping the Indianapolis, Newcastle & Toledo Electric Railway Company, have sublet the contract for grading, ballasting and track-laying to J. T. Adams, of Columbus, Ohio, and S. E. Seagraves, of Toledo, Ohio. Grading is to be started at once.

MANITOWOC, WIS.—The Fox River Valley Railway Company, organized a year ago to construct an interurban between Sheboygan and Kaukauna, has increased its capital from $25,000 to $200,000. It is proposed to construct the line from Manitowoc to Sheboygan at once, and then extend to Kaukauna next year. The company has floated $400,000 of its bond issue, it is said, and there is assurance that the road will be built.

NORTH YAKIMA, WASH.—A movement is on foot to organize a syndicate of business men to build and operate an electric railway system for the city of North Yakima, and connecting with other parts of the valley. The business men who will enter the scheme will put up $100,000 and all needed above that amount will be raised by mortgages on the plant. The citizens propose to build with the idea of turning the system over to the city at some future time.

KANSAS CITY, MO.—D. B. Holmes and other Kansas City men are named as incorporators in a company that proposes to build an electric line between Joplin, Mo., and Pittsburg, Kas. The company recently filed articles of association in Joplin. The company proposes to operate a city service in Joplin and an interurban service between Joplin and Pittsburg. Some of the other Kansas City men in the company are: H. C. Page, G. W. Carpenter and John S. Southerland.

LAPORTE, IND.—The survey for the construction of an electric railway to connect South Bend and Chicago *via* Michigan City and Gary, and a connecting link in the system which is to be operated between Cleveland and Chicago, has been completed. The statement is authorized that construction work, part of which is under way, is to be pushed with all possible speed, the financing of the road having been arranged. This is the line in which the Hanna syndicate, composed principally of Cleveland capitalists, is interested.

AKRON, OHIO—The Mandelbaum-Pomeroy syndicate has awarded the contract for the construction of the electric line between Mansfield and Seville to the Cleveland Construction Company. The work is to be completed early in 1907. This line will supply the missing link connecting the Ohio Central Traction line, uniting Bucyrus, Galion, Crestline and Mansfield with Cleveland, and connecting with the Cleveland & Southwestern line at Seville. It will also give those towns direct connection with Akron, when the Northern Ohio Traction and Light Company extends its Wadsworth line to Seville.

INDUSTRIAL ITEMS.

THE ALLIS-CHALMERS COMPANY, Milwaukee, Wis., in bulletin No. 1503 describes and illustrates the Allis-Chalmers Reliance-Corliss engine of the direct-connected type.

THE BLISS ELECTRIC CAR LIGHTING COMPANY, Milwaukee, Wis., in bulletin No. 80, describes the vestibule-type coupler with automatic jumper used with the Bliss system.

THE CALCULAGRAPH COMPANY, 1444 Jewelers' Building, New York city, is distributing a neat souvenir in the form of a facsimile of a calculagraph record card used by the Japanese Porcelain Company, of Noritaka, Japan.

THE FARR TELEPHONE AND CONSTRUCTION SUPPLY COMPANY, 118-120 West Jackson boulevard, Chicago, Ill., will be pleased to send catalogue No. 19 to any one interested in telephone apparatus and telephone line supplies.

THE DEAN ELECTRIC COMPANY, Elyria, Ohio, has ready for distribution bulletin No. 102, describing common battery telephones. In addition to the text and the illustrations of the telephone apparatus there are a number of very clear diagrams of connections.

THE JEFFREY MANUFACTURING COMPANY, Columbus, Ohio, has published a neat folder descriptive of Jeffrey flexible wire-rope conveyers. The company also makes chain and rubber-belt conveying machinery, and will be pleased to send catalogues and full information upon request.

W. R. OSTRANDER & COMPANY, 22 Dey street, New York city, will be pleased to send literature describing the "Morse" adjustable fixtures for use in factories, shops, schools and draughting rooms, incandescent lamp replacers and cleaners, and the "Connecticut" coil current indicator and coil switches.

THE AMERICAN ELECTRIC SIGN COMPANY, 41-45 Van Buren street, Chicago, Ill., is distributing a large poster illustrating various forms of telephone signs. The company is the manufacturer of electric advertising and commercial signs, flashlight signs and board signs. The electric signs are wired complete with rubber-covered and braided wire of proper carrying capacity.

THE JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J., will be pleased to send to any one interested, upon request, a reprint of the speech delivered by the Hon. John A. Walker, vice-president and general manager of the company, before the members of the Boost Club, New York, May 10, entitled "A Concise History of Lead Pencil Making."

THE LOMBARD GOVERNOR COMPANY, Ashland, Mass., has ready for distribution bulletin No. 106, illustrating and describing its type "Q" governor. This is the latest design the company has put on the market. Some sixty of these machines are now in use, and their performance is fully up to the company's expectations. The company states that this type shows a distinctly better regulation than its types "B" and "D," which have always been highly regarded.

THE POWER AND MINING MACHINERY COMPANY, Milwaukee, Wis., will shortly have ready for distribution catalogue No. 6, descriptive of machinery for roasting, smelting and refining copper and silver-lead ores. This catalogue will contain about 176 pages, six by nine inches, amply illustrated, and will give information of interest to the practical mining and smelting man. It will be ready for distribution about the middle of July, and will be sent to any one interested upon request.

GILLETTE, VIBBER & COMPANY, New London, Ct., is making a specialty of the "G. V." pipe-cap for covering the outdoor end of service pipe carrying any number of wires. These pipe-caps are made in eight sizes, from one-half inch to three inches. They can be applied without interrupting the service, can be used on either threaded or plain pipe, are equipped with brass screws, and can be used for any number of wires, including cables. The company will be pleased to send samples and literature upon request.

THE ABNER DOBLE COMPANY, San Francisco, Cal., has relocated its offices at its former site, Fremont and Howard streets. The company is one of the first to resume operations in the burned district, and has taken contracts for a large amount of work in addition to the orders on hand previous to the fire. Work is progressing rapidly on the company's new shops and warehouses in the Potrero district, at Seventh and Hubbell streets. Temporary pattern and forge shops are already in operation on the new site.

THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, Pittsburg, Pa., has ready for distribution special bulletin No. 7,049, giving the range of capacities of different types of alternating and direct-current motors for all classes of service. The literature in this pamphlet is so arranged as to make a convenient reference to this apparatus. The company in circular No. 1129 and circular No. 1134 describes and illustrates, respectively, the No. 119 railway motor for direct-current service, and electrical and mechanical brakes for Westinghouse type "K" motors.

THE MARINE ENGINE AND MACHINE COMPANY, 126 Liberty street, New York city, has been awarded the contract by the Department of Water Supply, Gas and Electricity, of the city of New York, for two 5,000,000-gallon pumping engines for the Canarsie pumping station, borough of Brooklyn. These engines will be of the horizontal triple-expansion crank and flywheel type, with a guaranteed duty of 150 foot-pounds per thousand pounds of dry steam, and similar to the two engines now being built by the company for the New Lots pumping station of the borough of Brooklyn.

THE DE LA VERGNE MACHINE COMPANY, New York, N. Y., reports the following recent sales of the "Hornsby-Akroyd" crude and fuel oil engines: the Fulton Bag and Cotton Mills, Atlanta, Ga., fifty-horse-power engine to drive general machinery. F. P. Pfieghar & Son, New Haven, Ct., 125-horse-power engine, direct-connected to generator. Wissahickon Electric Company, Fort Washington, Pa., fifty-horse-power engine. Iola-Aurora Production Company, Iola, Kan., twenty-horse-power engine for driving general machinery. Marconi Wireless Telegraph Company of America, New York city, seven-horse-power engine.

THE ELECTRIC CABLE COMPANY, 17 Battery place, New York city, has secured orders from the American Railways Company, Altoona, Pa., and from the Taluca Light and Power Company, Taluca, Tex., for "Voltax" compounds, to be used in both cases for insulating purposes. The Public Service Corporation, of Aurora, Ill., has also recently placed a large order for "Voltax," and orders have been secured from the Brass Goods Manufacturing Company, of Brooklyn, N. Y., for waterproofing concrete floors, and the Paul Smith's Hotel Company will use "Voltax" as a waterproofing compound on telegraph and trolley poles and fence posts on its property in the Adirondacks.

NEW MANUFACTURING COMPANIES.

LANSING, MICH.—The Sharon-Quinlaren Electrical Company, of Detroit, has been incorporated with a capital of $1,000.

COLUMBUS, OHIO—The Cleveland Gas and Electric Fixtures Company, Cleveland, has been incorporated with a capital of $250,000 by B. G. Tremaine, W. C. Hine, R. W. Hine, H. A. Tremaine and J. R. Crouse.

SALT LAKE CITY, UTAH—Articles of incorporation of the Davis County Plumbing and Electrical Supply Company have been filed in the office of the secretary of state. $5,000. Incorporators: J. H. Robinson, of Farmington; Dan Muir, of Woods Cross, and David Stoker, of Bountiful.

AUGUSTA, ME.—The Consolidated Railway Electric Lighting and Equipment Company has been organized at Augusta for the purpose of manufacturing and dealing in machinery for generating, heating, ventilating and power, and for other purposes, with $16,000,000 capital stock, of which nothing is paid in. The president and treasurer is I. L. Fairbanks, of Augusta.